What Caused the 2007-9 Crisis and How I Think We Should Have Prevented It and Fixed It and What to Do Now

John Geanakoplos

Yale University

Ellington Capital Management

Santa Fe Institute

Outline

- Leverage Cycle caused it
- Forgiveness would have fixed it
- Reform Fed Goals and Monetary Policy
- Energize Office of Financial Research
- Infrastructure
- Entitlement Reform

Leverage Cycle

- My experience at Kidder Peabody in 1994
  - Collateral Equilibrium 1997
- My experience at Ellington in 1998
  - Leverage Cycle 2003

Leverage Cycle Theory

- Long Period of Low Volatility and Financial Innovation Leads to Increased Leverage and Increased Activity
- That raises asset prices
- And makes economy more vulnerable.
- Scary Bad news decreases leverage
- That lowers asset prices and activity and leaves debt
- Lesson : Fed should regulate leverage
- In acute stage of crisis, Fed must prop up leverage.
- If in aftermath, depressed asset prices stay too low relative to debts, debt must be forgiven

Leverage Cycle

- Seems like common sense.
- Yet major implications still not accepted, even if more attention paid to it:
  - Empower Fed to regulate leverage
  - Put endogenous leverage into macro models
  - De-stigmatize Default and Forgiveness

Shakespeare got this Right 400 years ago.

The Merchant of Venice

Who can remember the interest rate Shylock charged Antonio and Bassanio?

Bassanio is no fool.

Quality of Mercy

Definition of Asset Leverage vs Investor Leverage

- Collateral = Asset put up as guarantee of loan. Often a house. I will assume no-recourse loans, like housing.
- If can use $100 house to borrow $80, then margin or down-payment or haircut is 20%
- LTV is 80%, leverage is 5.
- Leverage on new loans is key: different from debt/equity on old loans. Reinhart-Rogoff talk about leverage going up for 2 years after big crisis, then de-leverage for 5-7 years. Using Old leverage.

Equilibrium Leverage

Standard Economic Theory:

Equilibrium (supply = demand) determines interest rate.

In my theory:

Equilibrium determines Leverage as well.

Surprising that one equation can determine two variables. In standard theory either ignore default (hence need for Collateral) or fix leverage at some constant.

What Determines Leverage

- Interest rates determined by impatience.
- Leverage determined by uncertainty about and disagreement over future collateral prices because lenders worried about default. Volatility is crucial.
  - In long run financial innovation increases leverage, e.g. by creating tranching and pyramiding

Why Leverage is important

- As every trader knows, if leverage is 5, and asset moves by 1%, your return moves by 5%. If house price is $101, sell it, return $80 and make $1 on $20 = 5%. If banks hadn't been so leveraged, they wouldn't have lost so much money and we wouldn't have had bailout.
- No-recourse collateral gives borrower the "put option" to walk away from the house. House falls in value to $0, borrower walks away and loses only $20 even though lender loses $80.
- Pundits say these two effects of leverage had big effect on crisis. My theory also includes these two effects.
- But real significance of leverage in my theory is that it allows just a few investors to buy so many assets, and so explains bubbles.

More Leverage → Higher Asset Prices

Low Leverage → Lower Asset Prices

- Leverage gives optimists more buying power.
- Relies on no short sales.

Marginal Buyer Theory of Price

Natural buyers = Optimists

Marginal buyer

Public = Pessimists

If no short selling. That's why CDS became important.

Heterogeneous Agents

- Natural Buyers vs Public
- Differ in risk tolerance.
- Differ in ability to hedge.
- Differ in sophistication and knowledge.
- Might use assets for production.
- Might get higher utility for holding assets
  - Like houses
  - Leads to equilibrium leverage giving default
- Or just more optimistic (different priors)
  - Leads to equilibrium leverage without default, like Repo market.

II. Leverage Cycle in Theory

- Long period of Low Volatility
- Leverage goes up because of low vol and gradual innovation
- Optimists acquire more and more of assets
- Asset prices go up
- Sets stage for crash

Leverage Cycle Crashes Always Have same three aspects

- Bad news makes everyone value assets less. But bad news is also scary, creating more uncertainty and more disagreement = high volatility
- De-leveraging because nervous lenders ask for more collateral
- Leveraged buyers (optimists) crushed, some go bankrupt, others insolvent and functioning poorly.

Leverage Cycle Crashes

Price falls more than any agent thinks it ought to because marginal buyer changes

Highs and Lows

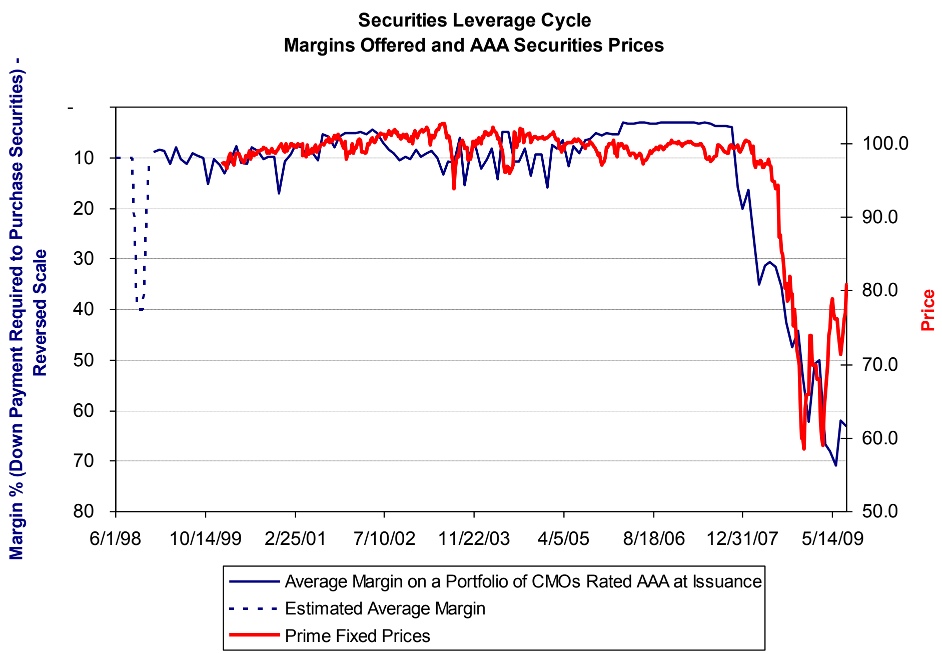
- Leverage makes the asset price higher than it would have ever been without leverage.
- But the low is lower than it would have been without leverage.
- The gap between high and low is thus much bigger than it would have been.
- Thus the number of underwater businesses and homeowners can be huge

III. Recurring Leverage Cycles

- Tulip bulb craze in 1637 in Holland.
- Land boom and crash in 1920s in Florida before Depression.
- Land boom and crash in Japan in 1980s-1990.
- 1998 emerging markets and mortgages, bankrupted Long Term Capital
- 2007-9 subprime mortgage crash

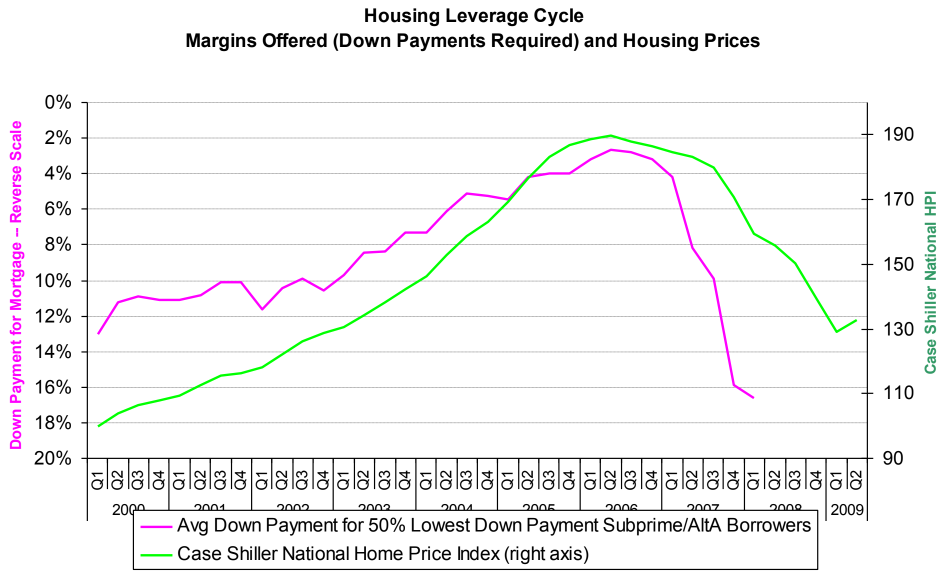
The current leverage cycle

Repo Market Leverage



Note: The chart represents the average margin required by dealers on a hypothetical portfolio of bonds subject to certain adjustments noted below. Observe that the Margin % axis has been reversed, since lower margins are correlated with higher prices.

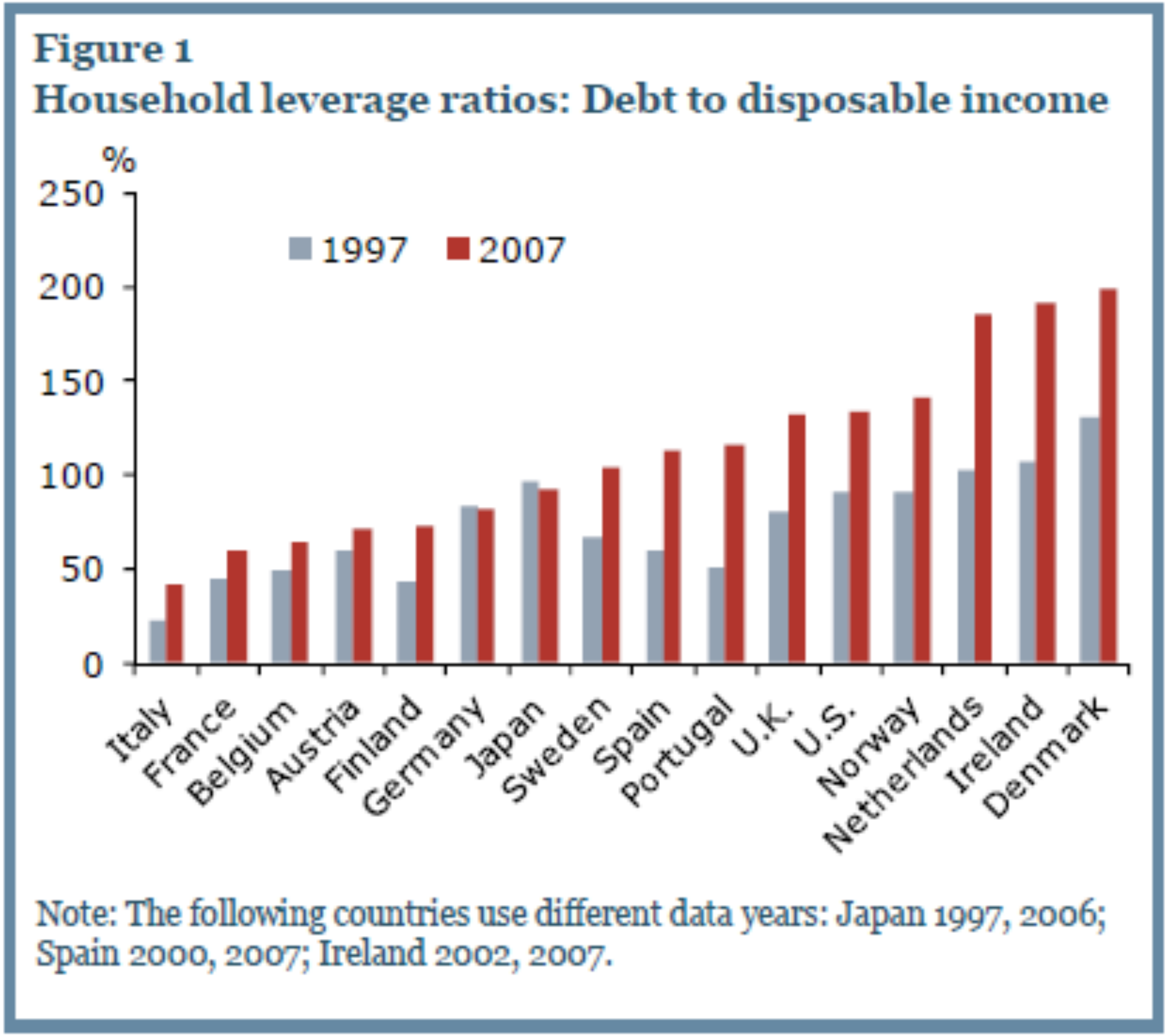
The portfolio evolved over time, and changes in average margin reflect changes in composition as well as changes in margins of particular securities. In the period following Aug. 2008, a substantial part of the increase in margins is due to bonds that could no longer be used as collateral after being downgraded, or for other reasons, and hence count as 100% margin.



Observe that the Down Payment axis has been reversed, because lower down payment requirements are correlated with higher home prices.

Note: For every AltA or Subprime first loan originated from Q1 2000 to Q1 2008, down payment percentage was calculated as appraised value (or sale price if available) minus total mortgage debt, divided by appraised value. For each quarter, the down payment percentages were ranked from highest to lowest, and the average of the bottom half of the list is shown in the diagram. This number is an indicator of down payment required: clearly many homeowners put down more than they had to, and that is why the top half is dropped from the average. A 13% down payment in Q1 2000 corresponds to leverage of about 7.7, and 2.7% down payment in Q2 2006 corresponds to leverage of about 37.

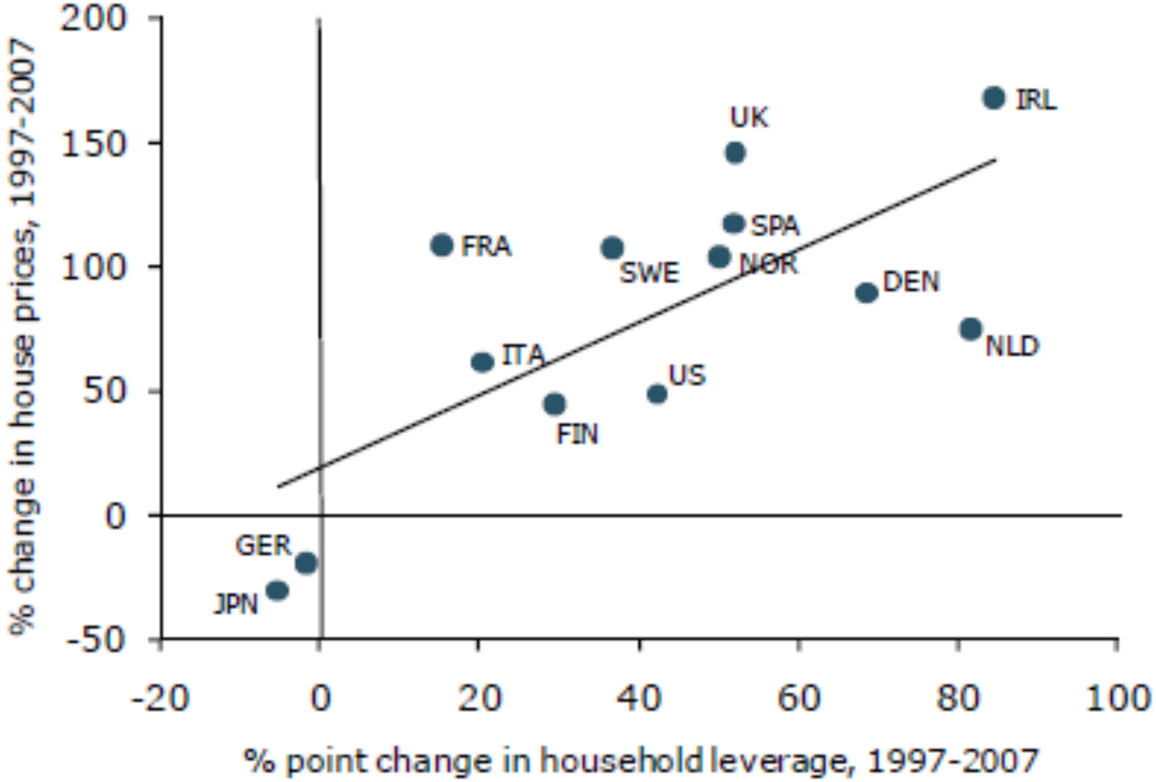
Note Subprime/AltA Issuance Stopped in Q1 2008.



Glick-Lansing FRBSF 2009

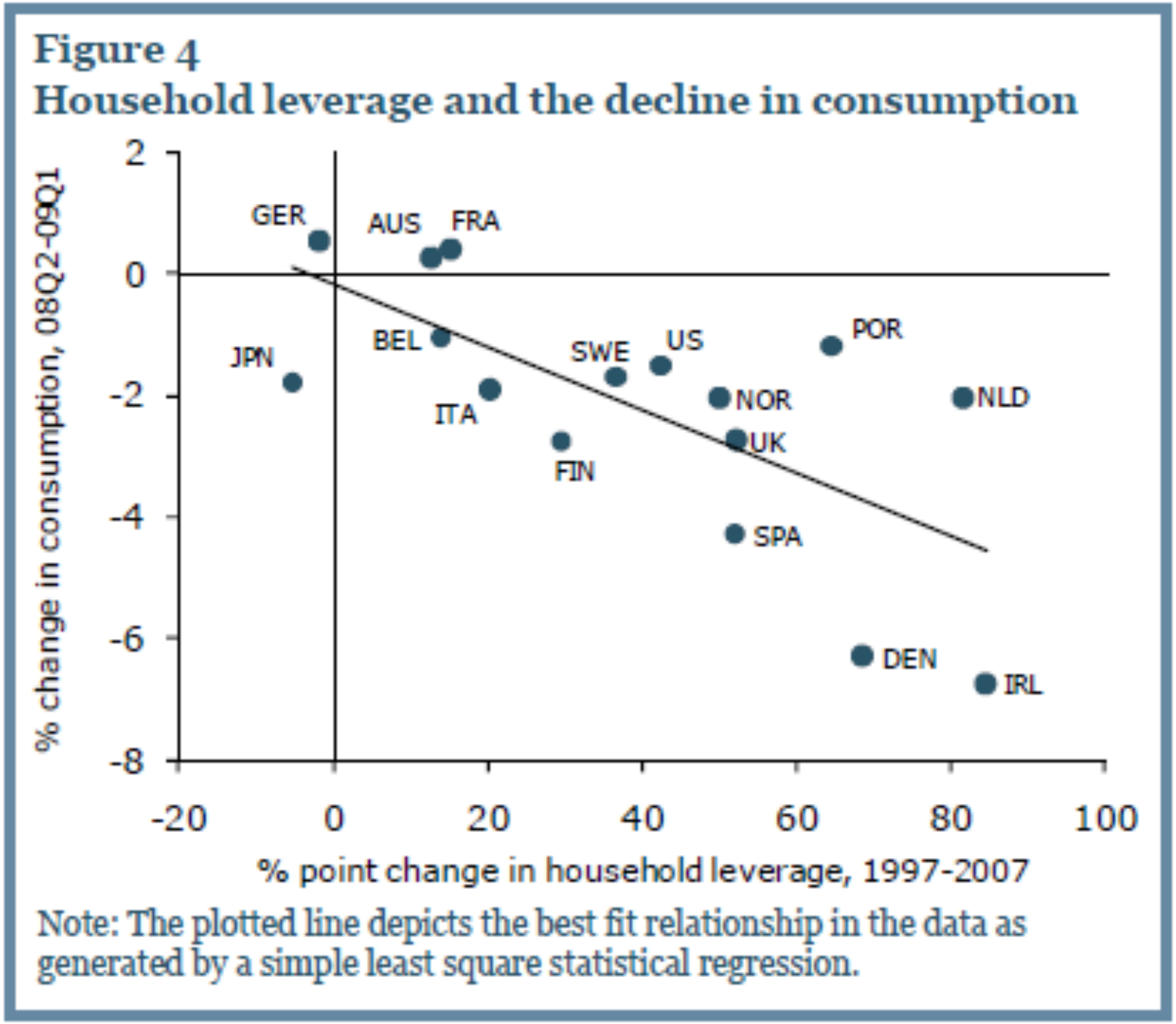
Leverage is debt to equity in this San Francisco Fed study

Figure 3
Household leverage and the run-up in house prices



Note: The plotted line depicts the best fit relationship in the data as generated by a simple least square statistical regression.

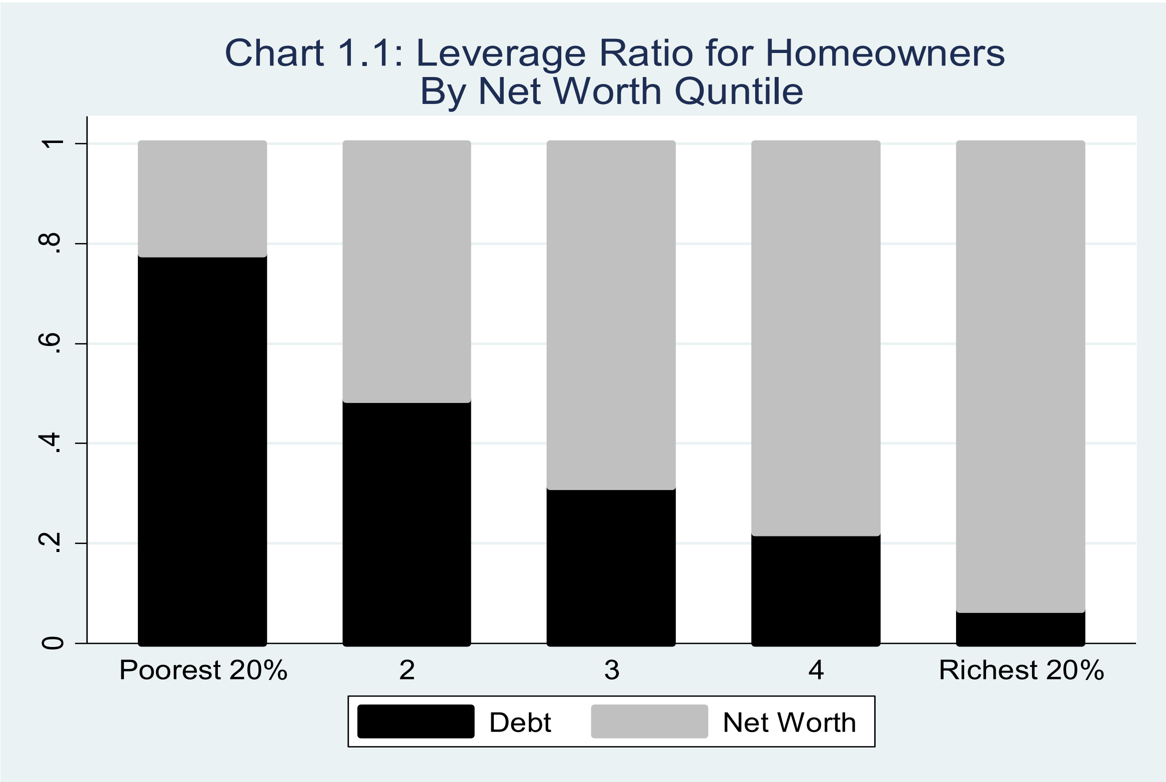
Glick-Lansing FRBSF 2009



Glick-Lansing FRBSF 2009

The Net Worth Shock

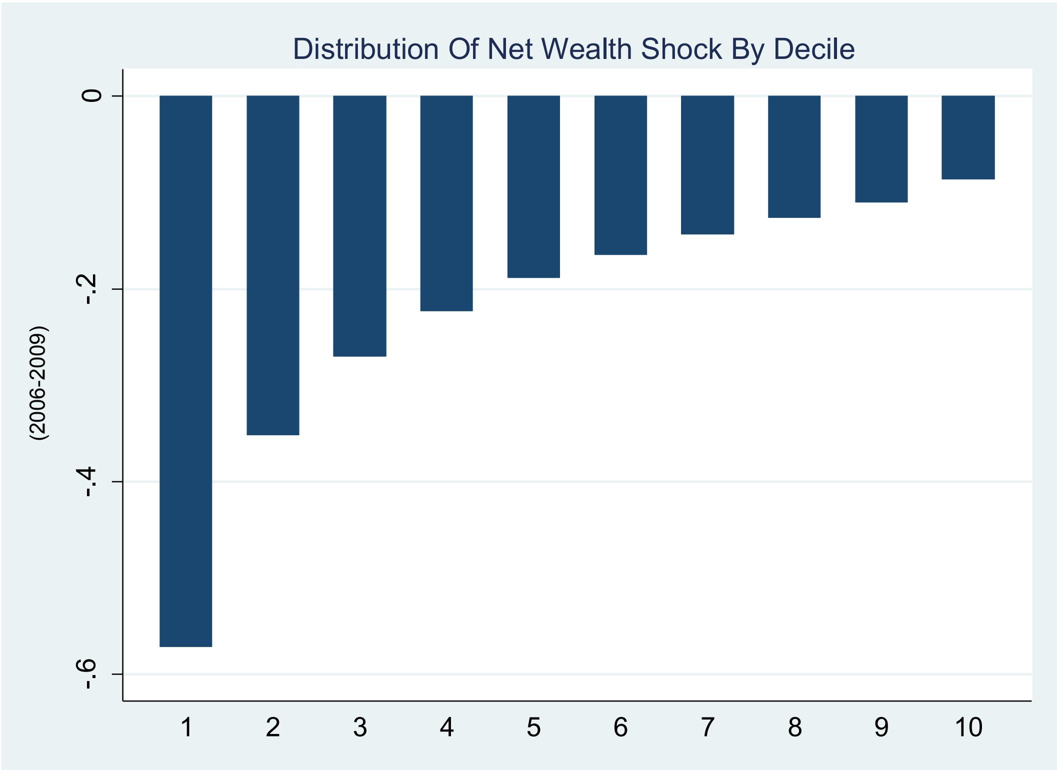
- Leverage by net worth and housing shock correlation



Mian-Sufi

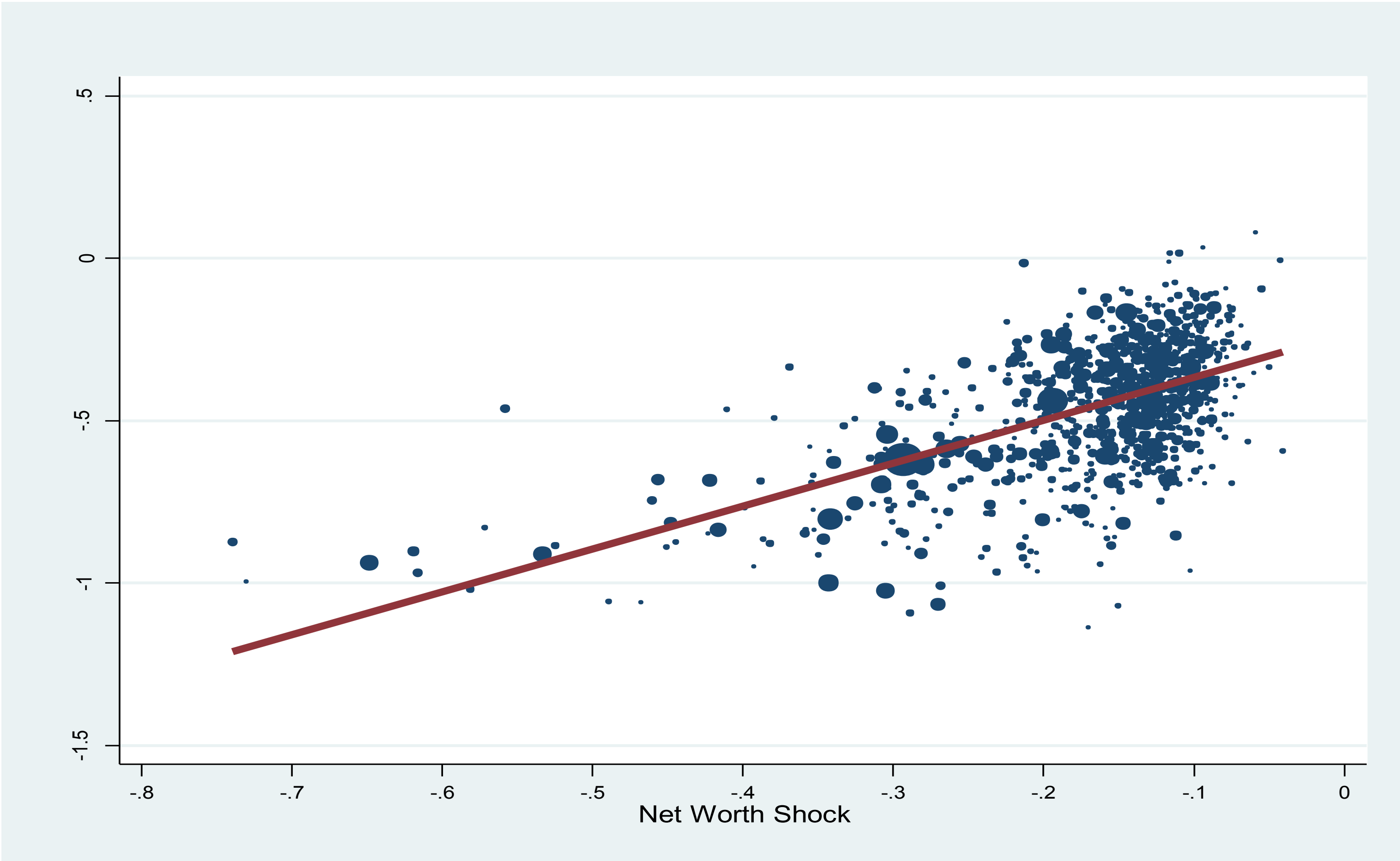
The Net Worth Shock

- Net worth change in the cross-section of zip-codes



Mian-Sufi

Net Worth Shock and Change in Consumption

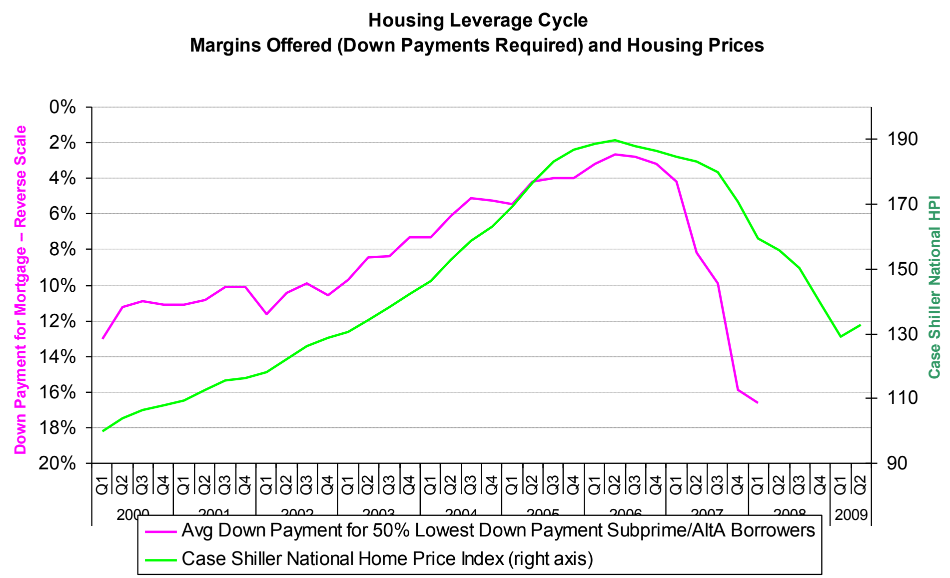


Mian-Sufi

How did crash start?

- Conventional view is that housing prices suddenly fell, and fell more than anyone imagined, so banks lost huge money, and that rippled through economy.
- My view: Housing prices had been going up because of increasing leverage, but LTV can't go above 100, so increase bound to stop as LTV approached 100.
- Scary bad news of delinquencies + credit default swaps creation in mortgages at top of cycle led to dramatic fall in BBB prices before big fall in housing prices.
- Led to tightening of collateral on houses. That led to dramatic fall in housing prices. Then government did not intervene properly in housing market, and prices fell further.

Look More Closely at Timing



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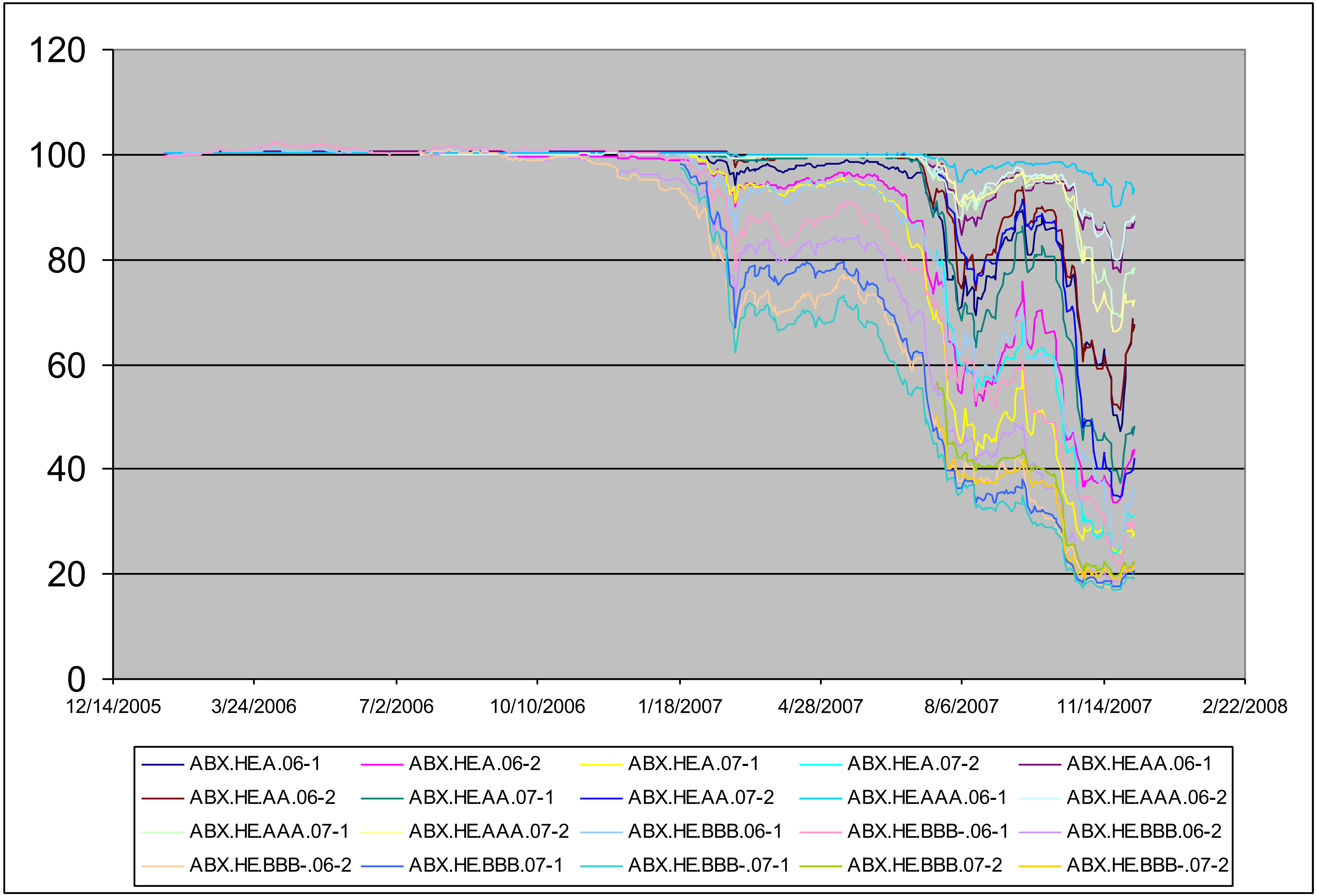
Note Subprime/AltA Issuance Stopped in Q1 2008.

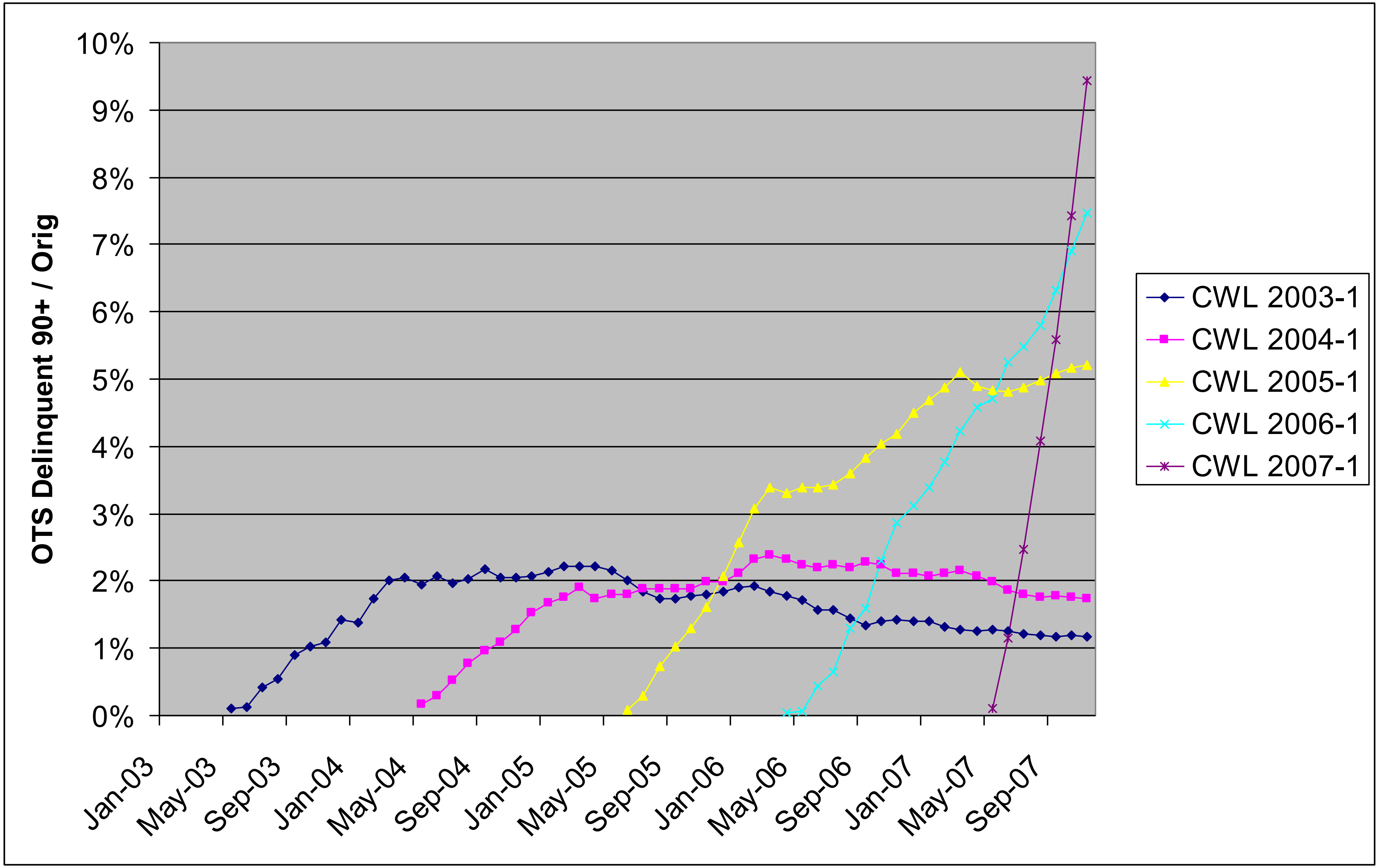
Housing Peak at Q2 2006
Slightly down Q4 2006
CDS created on subprime late 2005
ABX securities index collapses Jan 2007
Then housing prices start to free fall

BBB prices crash before big drop in housing



Scary
Bad News

DQ / Orig



IV. 2007-9 Worst Leverage Cycle because

- Leverage got higher than ever before.
  - Prolonged low volatility
  - Securitization innovation
  - Government implicit guarantees e.g. to Fannie and Freddie and to Too Big to Fail banks allows them all to borrow more cheaply, and therefore to leverage more.
  - Banks lied about how leveraged they were.
  - Low rates (global imbalances) encouraged search for yield via leverage.
- Double leverage cycle, in housing and securities.
  - Feedback between the two
- CDS appeared for first time at peak of cycle
  - Allowed pessimists to leverage and helped cause crash.
  - Since optimists selling insurance instead of buying it, CDS added to losses for optimists when asset prices fell
- Houses and banks further underwater making for bigger foreclosure deadweight costs

What's so bad about so much leverage? (1) Debt and Default

- What if optimists indispensable to economy, don't take into account effect on their workders. Bankruptcy externality.
- Debt overhang: When underwater will not choose PV > 0 projects because old investors get the money
- Cost of confiscation of collateral – homes today fetch ¼ of subprime loan amount when sold, after vandalism etc.

What's so bad about leverage? (2) Volatile Prices affect output and wealth

- Prices have real effects on economic activity. Tobin Q.
- At top so few buyers have such a big effect on prices. What if they are crazy? Construct many projects which look ridiculous in retrospect when cycle turns down. Costly if irreversible investment. Too much investment.
- At bottom people cannot sell new loan at $100 to buy car when a comparable old auto loan sells at $65. Too little investment.
- Unfair to subject risk averse public to so much volatility in income.
- Fortunes of natural buyers rise and fall through cycle. Changing inequality over cycle.

What Should We Have Done?

- Crisis began in January 2007 in subprime mortgages more than six years ago.
- Nothing substantial has been done to deal with massive foreclosure problem.
- Haven't begun to confront problem of debt overhang for homeowners, small businesses, and government.
- Only saved our banks.
- Should have forgiven subprime debt

Foreclosure Disaster

- 4 million homes already lost to foreclosure
- Of the 50 mm outstanding loans that are current:
  - 8.5 million underwater
    - 5.6 million Prime
    - 2.1 million Alt-A
    - 800 thousand Subprime
  - These loans are at high risk of defaulting as long as they remain underwater
  - If current default rates continue at same rate with unchanged housing prices, 3 million more will default in next few years

Principal should be written down

- Losses from foreclosure are horrible. Get on average 23% back on loan from foreclosing a subprime loan.
- Takes 18 months to 3 years nowadays to throw somebody out of his house.
- Mortgage not paid, taxes not paid, house not fixed, house often vandalized, realtor expenses etc.
- If write down principal on subprime loans, get more for lender and borrower!
- Example: $160,000 loan, $100,000 house. Could write down to $80,000 or $90,000.

Foreclosure Policy Mistakes

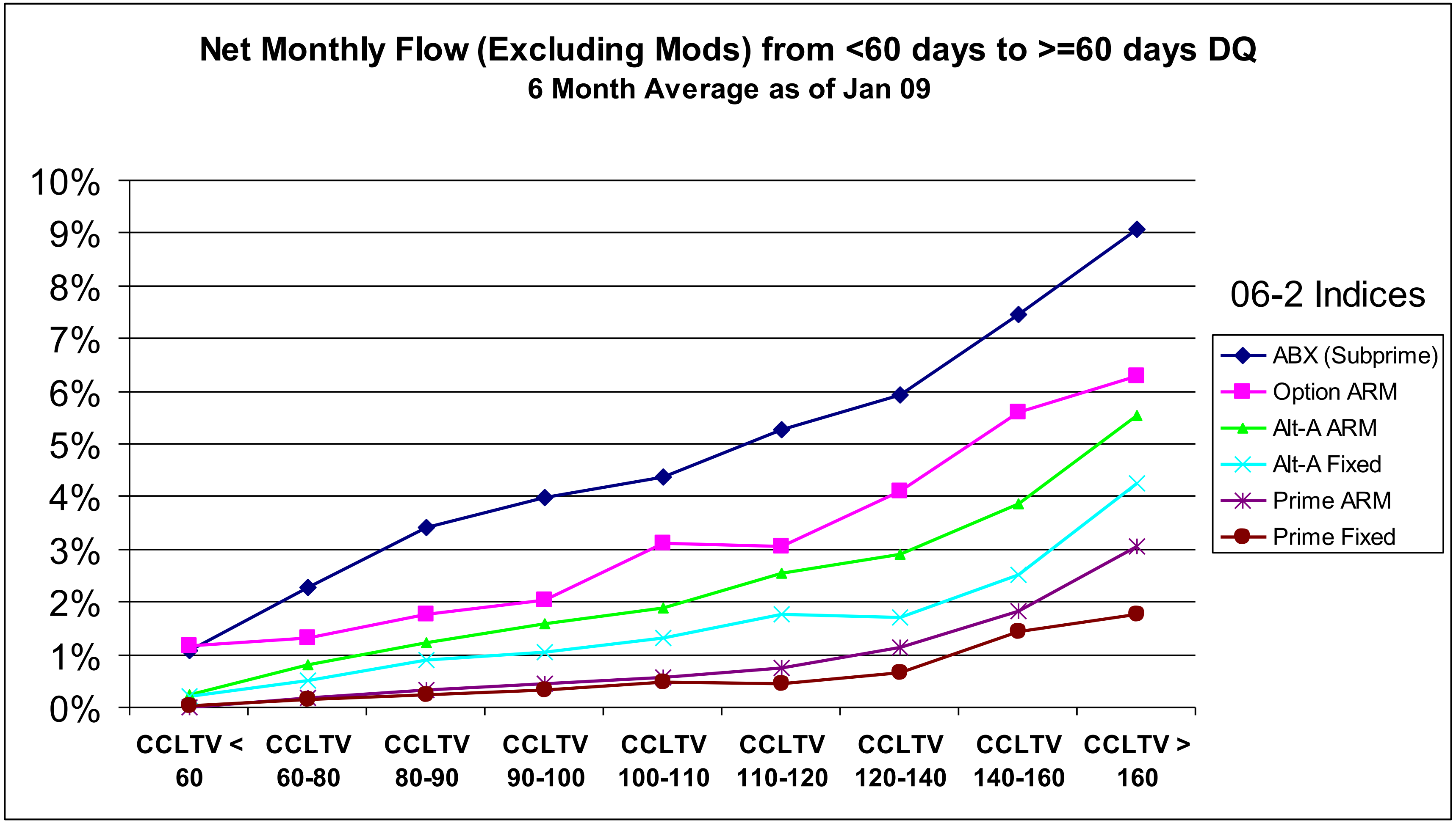
- Thought that temporarily writing down interest would make a big difference
- Thought could give small incentives to Servicers and Banks and they would make modifications

Warned 5 Years Ago

- Geanakoplos-Koniak in October 2008 NY Times Op-Ed “Mortgage Justice is Blind” explained why Servicers would never do proper modifications. Advocated community bankers.
- NY Times Op-ed March 2009 “Principal Matters” advocated writing down principal as only solution.

Community Bankers

- Government could hire community bankers in each area.
- Loan information would be sent to them.
- Their job would be to modify loans to make as much money as possible for lender.



Net Monthly Flow (Excluding Mods) from <60 days to >=60 days DQ
6 Month Average as of Jan 09
10%
9%
8%
7%
6%
5%
4%
3%
2%
1%
0%
CCLTV < 60
CCLTV 60-80
CCLTV 80-90
CCLTV 90-100
CCLTV 100-110
CCLTV 110-120
CCLTV 120-140
CCLTV 140-160
CCLTV > 160
06-2 Indices
ABX (Subprime)
Option ARM
Alt-A ARM
Alt-A Fixed
Prime ARM
Prime Fixed

Default, Punishment, Forgiveness

- Idea that defaulting is morally reprehensible.
- Or that forgiving loans would create moral hazard and encourage future default.
- And prevent lenders from lending.
- All wrong.

European Leverage Cycle

- Household borrowing problem in many countries
- Banks overleveraged.
- But also sovereigns overleveraged. (Because of implicit guarantees being in Euro).
- Need forgiveness.

Greek Problem

- Reduced primary deficit from 10% to 3%.
- Crushing austerity.
- People don't understand that Germans are currently giving Greeks money.
- Keep pressure on for reforms.
- Force primary deficit to zero.
- Then forgive debt.
- Greeks must be told in advance forgiveness will come if reforms met.

Reforming the Federal Reserve

- Federal Reserve currently charged with managing inflation and unemployment.
- Main policy instrument is interest rates. Formerly used mostly short rate. Lately (with quantitative easing) has moved to manage long rates.
- Should be responsible for managing systemic financial risk.
- Needs another policy tool.

Fed Should Manage Leverage as well as Interest Rates

- From Irving Fisher in 1907 and before it has been commonly supposed that the interest rate is the most important variable in the economy.
- When economy slows, public clamors for lower rates, and Fed obliges.
- Fed has been pumping out billions of dollars in bank loans. Fed lowered fed funds rate in December 2008 to zero, without much effect.
- But collateral rates or leverage more important in times of crisis, and also more important to prudential regulation. Tell banks cannot make mortgage loan at LTV > 90%.

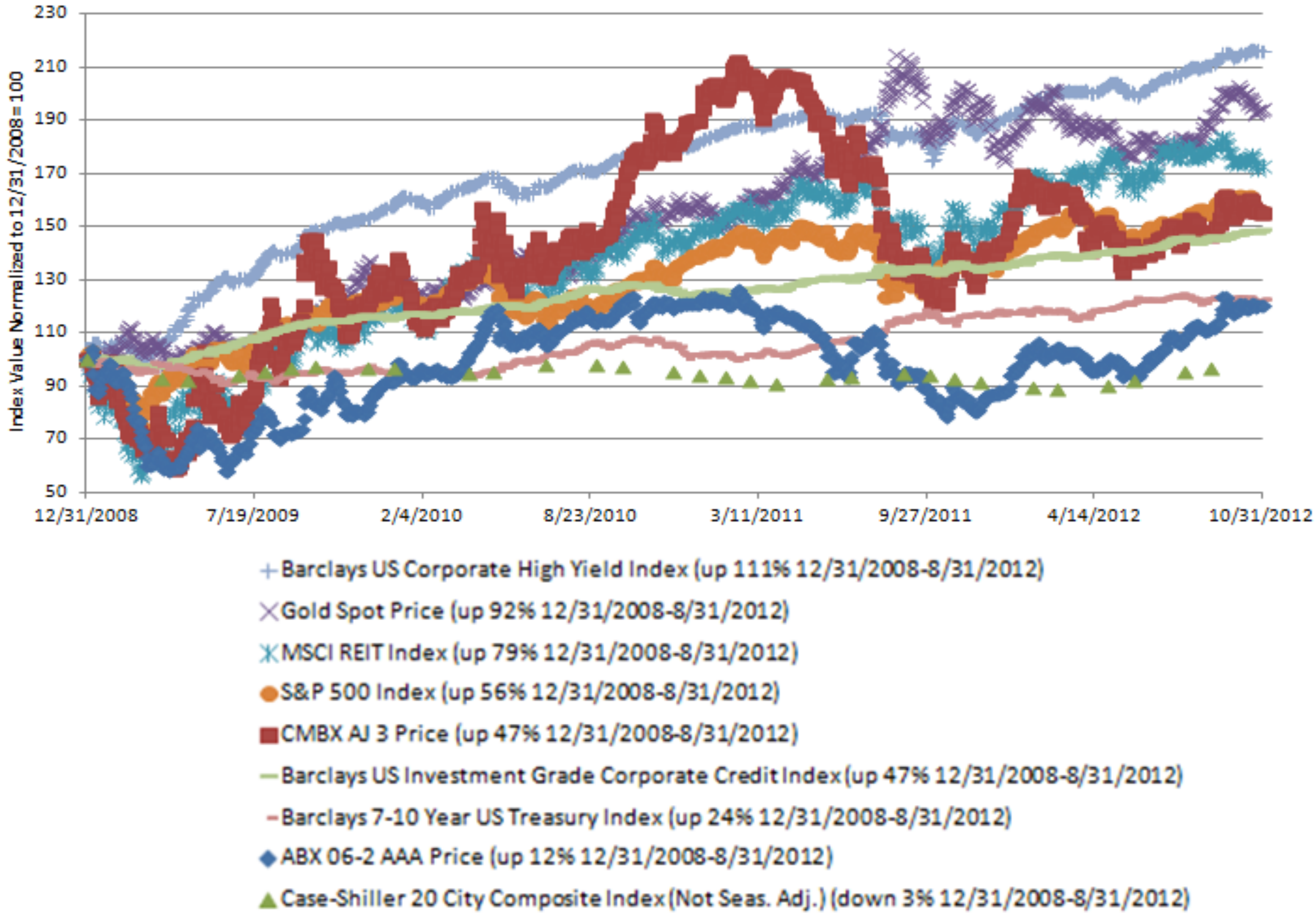
Monetary Policy in the Aftermath of the 2007-9 Crisis: Too Little Too Late.

- Ben Bernanke is a good man who dearly wants to
  - put Americans back to work
  - And to stabilize the economy
  - And to keep inflation in check
- You can't do all that with one policy tool: lowering interest rate(s)
- Need more policy tools. Also help from Congress and Treasury.

Progress from interest rate cuts?

- Short interest rate cut to 0 in 2008.
- Massive (3-4 $trillion) buying of long bonds to lower long rates started in 2009.
- Yet, unemployment still almost 8%, 6 years after crisis started.
- Housing prices still low
- Foreclosures still in full swing.
- Many borrowers still can't get loans.
- Crisis started in housing and mortgages. Not fixed.

Most Asset Prices Have Appreciated But Home Prices Were Left Behind



Total Mortgage Originations (Thousands) by FICO Score 2006 vs 2012

FICO Score	2006 Originations ('000)	2012 Originations Annualized ('000)	% Change
<600	1135.3	47.5	-95.8%
600-700	4434.5	1238.3	-72.1%
700-750	2712.3	1346.3	-50.4%
750-800	2372.6	2559.6	7.9%
800+	408.2	961.0	135.4%
Total	11062.9	6152.6	-44.4%

Drawbacks of Interest Rate only Policy

- Fed can push asset prices up, but that does not necessarily spur production.
- Significant activity financed by loans, and people or businesses that don't have collateral or high credit rating can't get loans even when interest rate goes down.
- So lowering interest rates can be ineffectual.
- Might increase spending as people feel richer. But looks like trickle down!

Dangers of Quantitative Easing- Long Interest Rate Cuts

- Increasing all asset prices except housing.
- May cause a bubble in some unintended sector like high yield, and then a crash there that will disrupt markets.

Dangers of Quantitative Easing-Long Interest Rate Cuts

- Huge amounts of money on sidelines. If all spent, would cause massive inflation. At zero interest, no reason to spend.
- Bernanke claims Fed can shield us from inflation by paying short interest on deposits.
- When short interest rates finally go back up, government will have huge interest payments to make, which could have been locked in at low long rates. If Congress

Dangers of Quantitative Easing- Long Interest Rate Cuts

- Looks like leverage cycle all over again; in fact 1994 leverage cycle.
- Government buying long assets by borrowing on short loans (paying short term interest rate to depositors).
- If short rates suddenly go up, then huge government losses. In 1994 long term bondholders forced to sell.
- Bernanke not forced to sell – unless Congress says cannot pay interest.

Office of Financial Research

What Should We Do Now?

- Policy Reaction in US and Europe
  - Lower interest rates
  - Temporary stimulus that ended
  - Fiscal austerity

Europe Far Worse

- Unemployment at 25% in Greece and Spain.
- Austerity counterproductive – Keynes said this, Krugman saying again and again to delay austerity: spend now, reduce debt later.
- But forgiveness is different issue. It goes beyond delaying austerity.

Deficit Reducing Stimulus

- Good infrastructure makes money in the long run. And it puts people to work, especially construction workers who are out of jobs anyway.
- Need a blue ribbon committee to rethink infrastructure of whole country. Do we go with high speed trains or more highways?
- Look at all shovel ready projects in new haven.

Reducing Deficit Mostly about Entitlements

- Rethinking medicare and social security
- Like defaulting and figuring out who will bear the losses.
- Worse thing to do is to pretend everyone will get paid.

END

- Ben Bernanke is a good man.
- But he can' t do it all by himself.
- Needs help from the Treasury and Congress.

What to Do About Leverage Cycle?

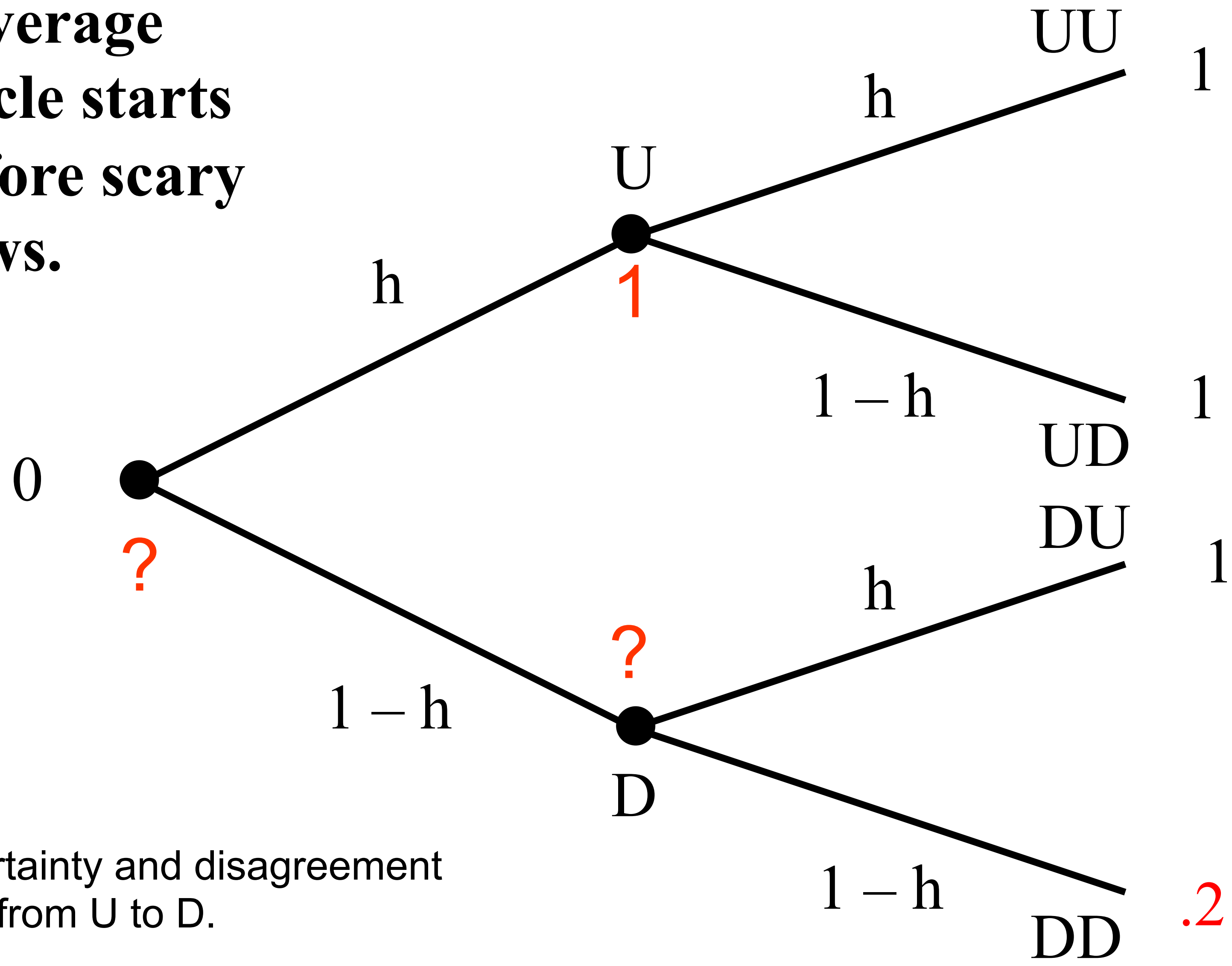
- Collect leverage data and make it public.
- Put CDS on exchange.
- Regulate security and investor leverage when normal
- In the crisis, reverse the three symptoms:
  - Reduce uncertainty. Clarify who is bankrupt and who not.
  - Re-leverage the system by going around banks to lend with less collateral. TALF, PPIP Establish a permanent facility.
  - Inject equity to replace natural buyers.
- In aftermath work to reduce debt overhang.
  - Stop foreclosures in order to avoid deadweight losses, and to stabilize uncertainty and margins: write down principal.

The Leverage Cycle

A Cause of the American and Global Crises

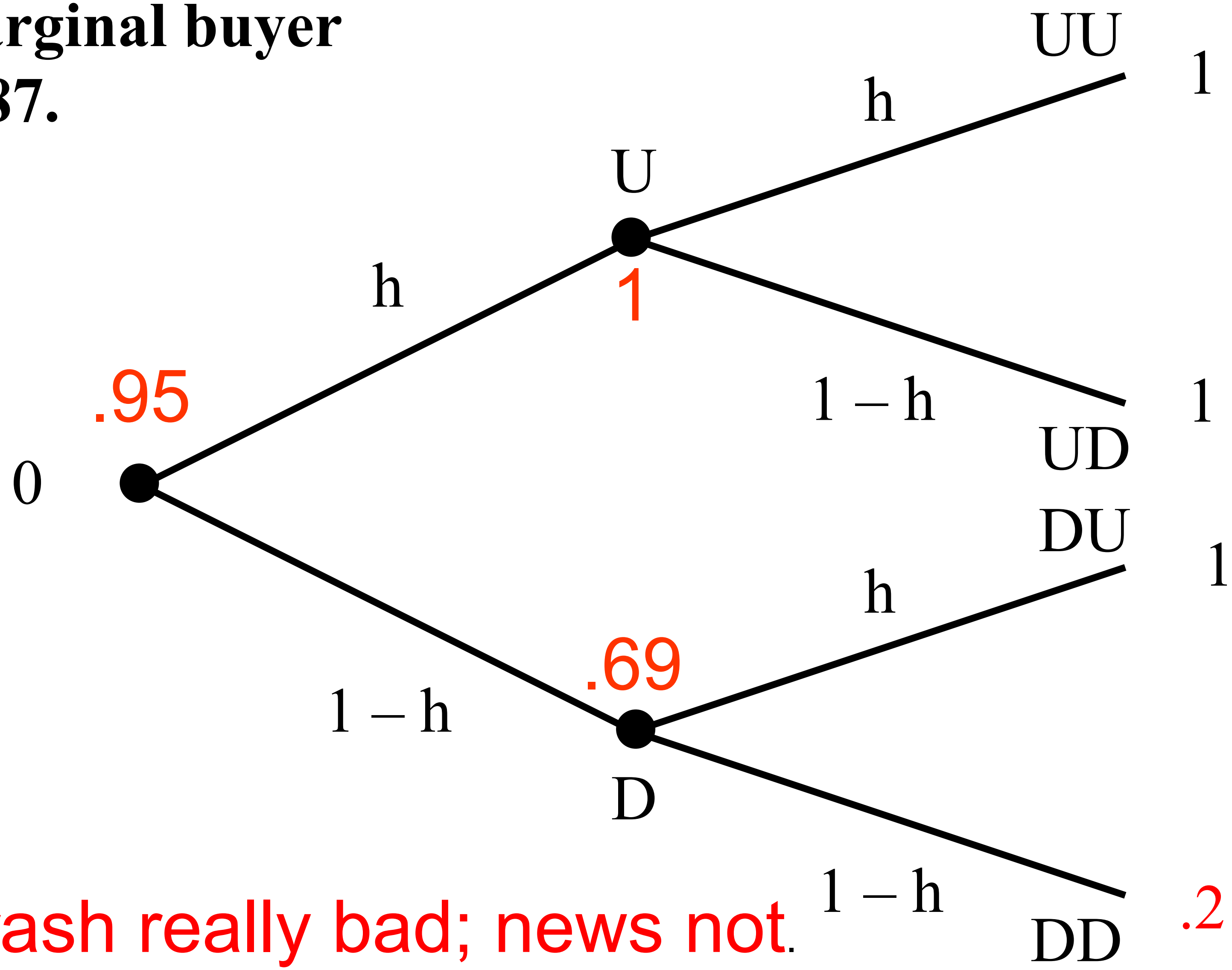
A Missing Ingredient Explaining the
Failure of Macroeconomic Theory to
Predict the Crisis or to
Predict the Duration of the Aftermath
Or to Cure the Problem so Far
Exciting Time to be a Macroeconomist

Leverage Cycle starts before scary news.



Uncertainty and disagreement grow from U to D.

Marginal buyer = .87.



Crash really bad; news not.

Top 13% of buyers go bankrupt.

Leverage at 0 = .95/.26 = 3.6; Leverage at D = .69/.49 = 1.4

Interest rates = 0.

Problem

- Too many homeowners underwater. By end of aftermath over 8 million households will be thrown out of their houses via foreclosure.
- Too many people who can’t get loans.
- Too many unemployed.
- Too much government debt

Concrete Solutions to Problems

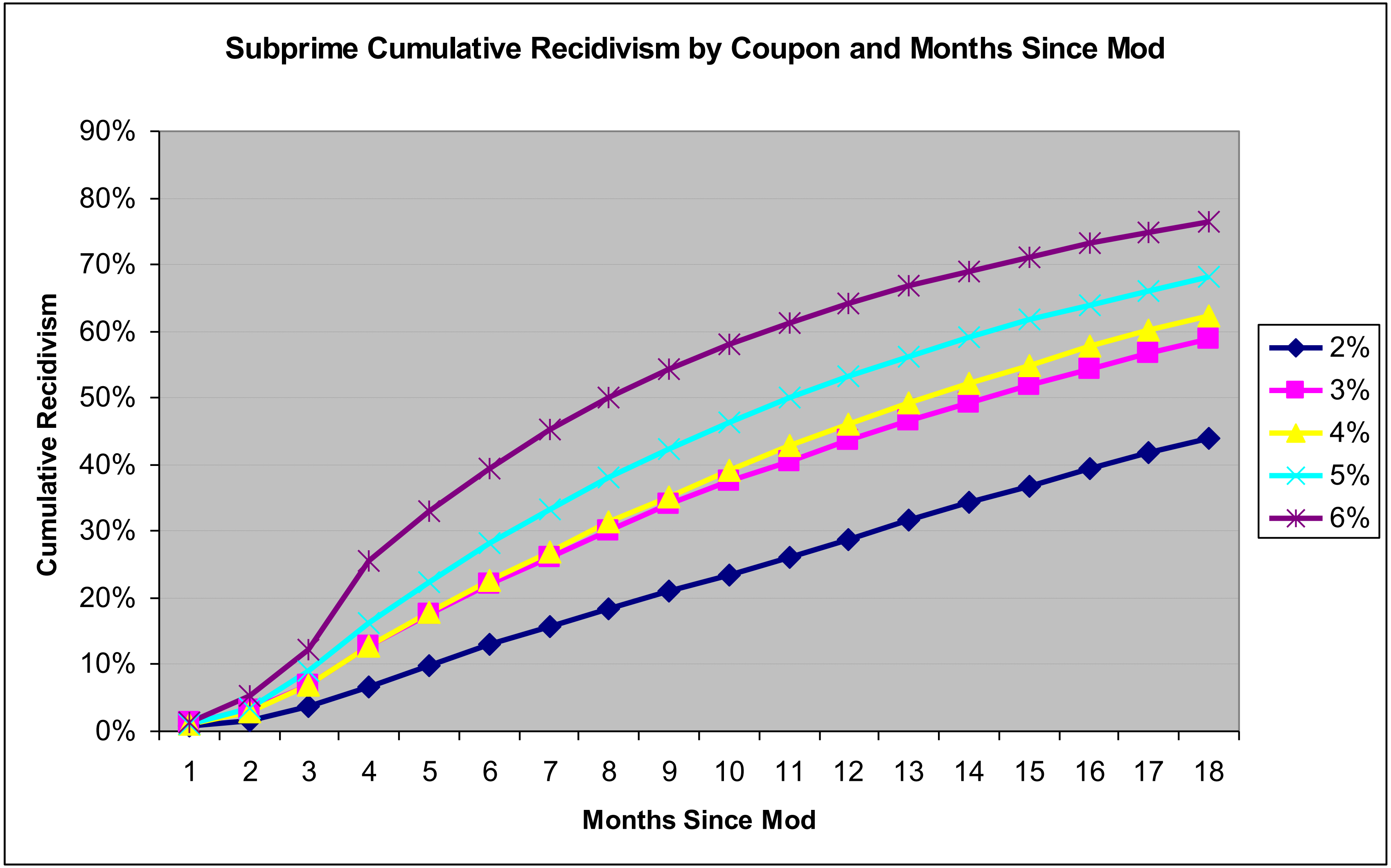
- Should have forgiven subprime debt that wasn't going to be paid back anyway.
- Make more loans to people who can't get them
- Should spend on infrastructure after comprehensive analysis of projects
- Should rethink social security and medicare
- Monetary policy too blunt an instrument. Risky.

Fed QE Timeline

- **QE1 (12/2008-03/2010)**
  - 11/25/2008: Fed announces purchases of $600B in agency RMBS and agency debt
  - 3/18/2009: Program is expanded by $750B in agency MBS and $300B in Treasuries
- **QE2 (11/2010-06/2011)**
  - 11/03/2010: Fed purchases $600B of longer-dated Treasuries over an 8 month period
- **Operation Twist (09/2011-2012)**
  - 9/21/2011: Purchase $400B of bonds with 6-30 year maturities and sell an equal amount of <3 year maturities
  - 6/20/2012: $267B added to Operation Twist
- **QE3 (9/13/2012-Present)**
  - Open-ended net purchases of $40B/month of agency MBS ($85B/month total) until the labor market improves "substantially"

What did we do about Housing? Modifications so Far about Lower Rates

- 600k modifications made permanent under HAMP
- Servicers have modified an additional 1.1 million loans under non-HAMP programs.
- Tiny number modified
- Wrong modifications
- Most simply redefault


Subprime Cumulative Recidivism by Coupon and Months Since Mod
Cumulative Recidivism
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
Months Since Mod
2%
3%
4%
5%
6%

Financial Innovation also a Cause

We propose the possibility that the mortgage boom and bust crisis

of 2007-2009 might have been greatly exacerbated by financial innovation.

Timing of financial innovation:

Leverage and Securitization came first, raising asset prices,
then

CDS followed much later, crushing their prices.

We propose the possibility that the mortgage boom and bust crisis

of 2007-2009 might have been greatly exacerbated by financial innovation.

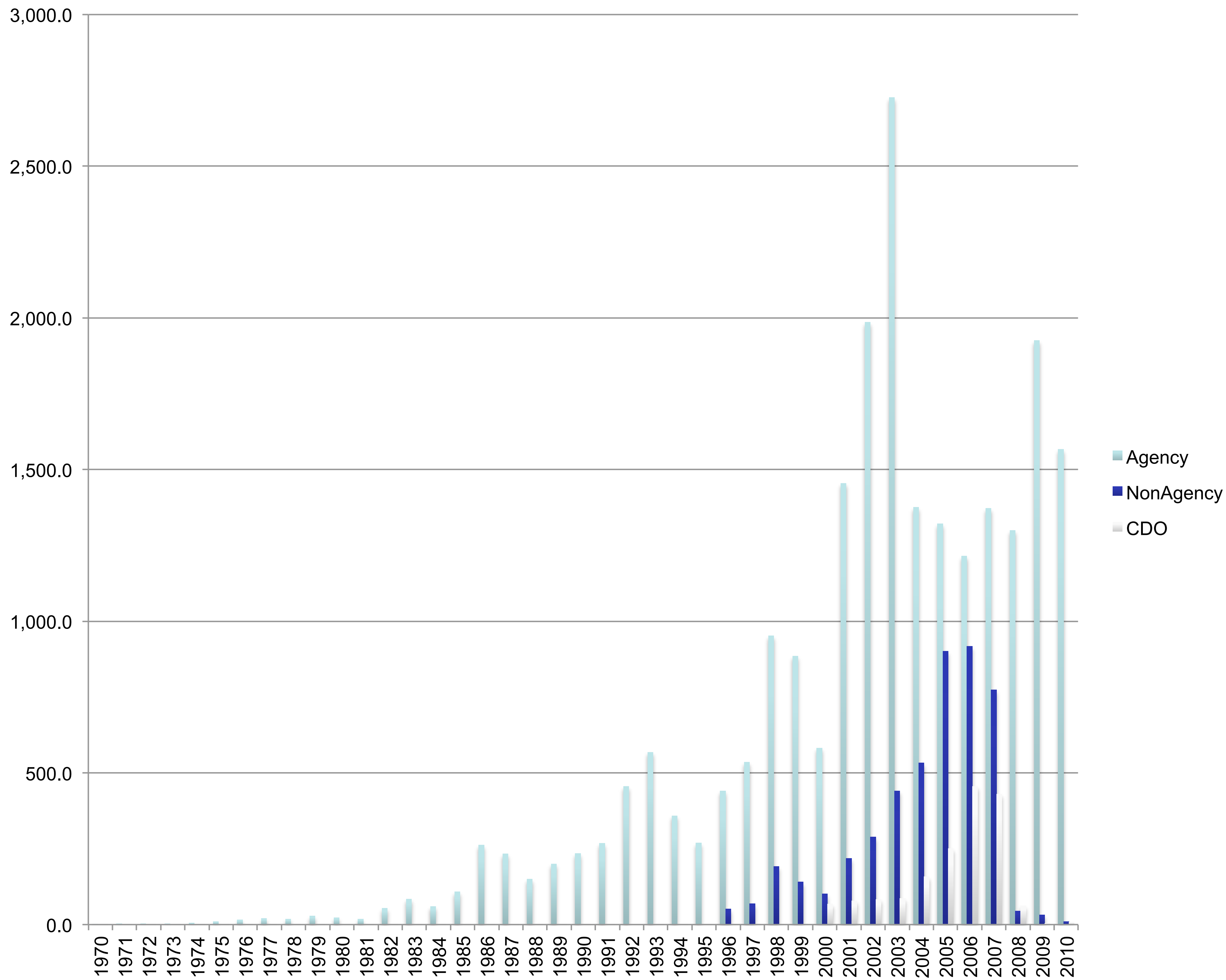
Timing of financial innovation:

Leverage and Securitization came first, raising asset prices,
then

CDS followed much later, crushing their prices.

Tranching

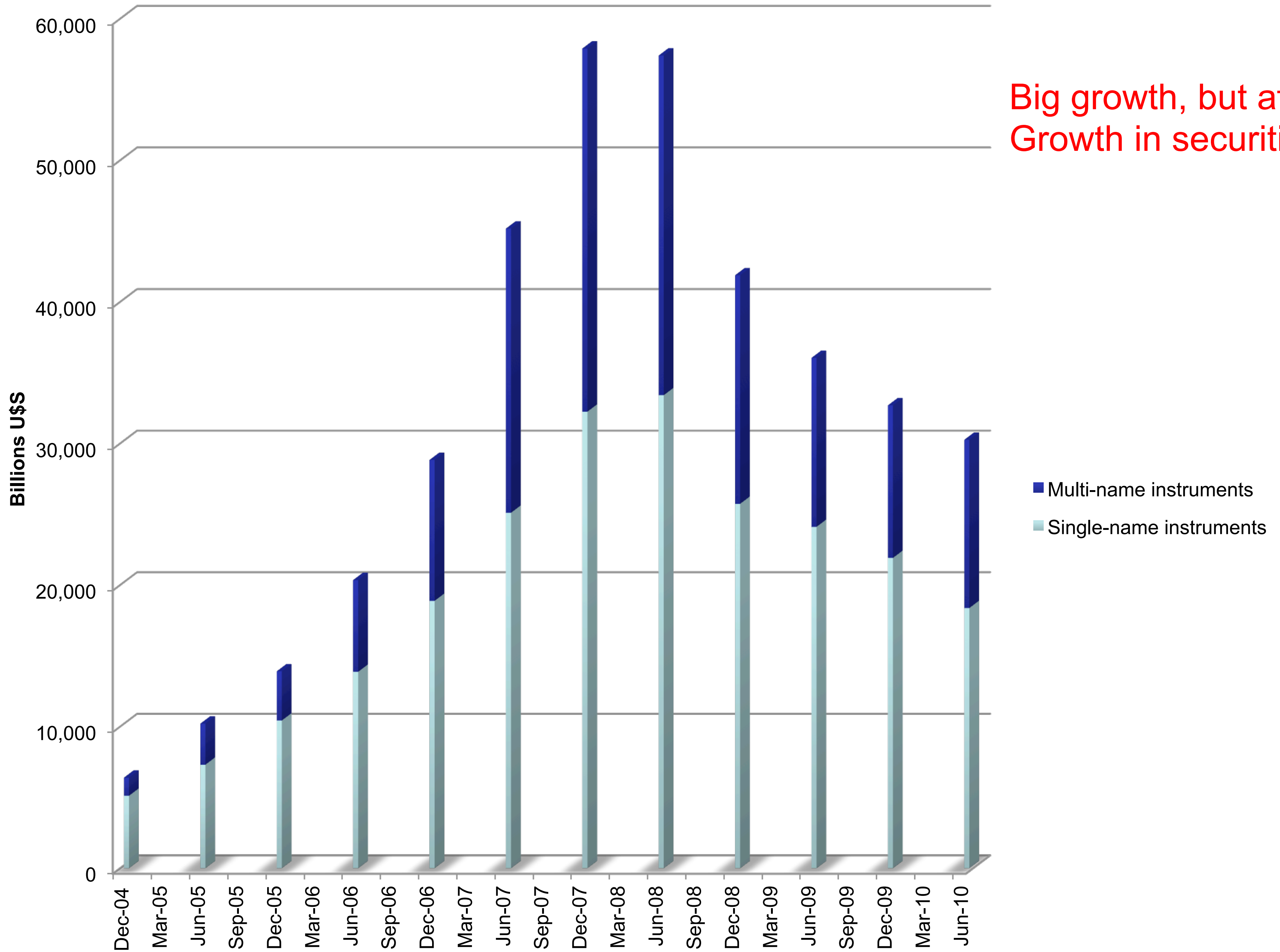
- A more sophisticated kind of leverage, with even greater effect on price.



3,000.0
2,500.0
2,000.0
1,500.0
1,000.0
500.0
0.0
1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
Agency
NonAgency
CDO

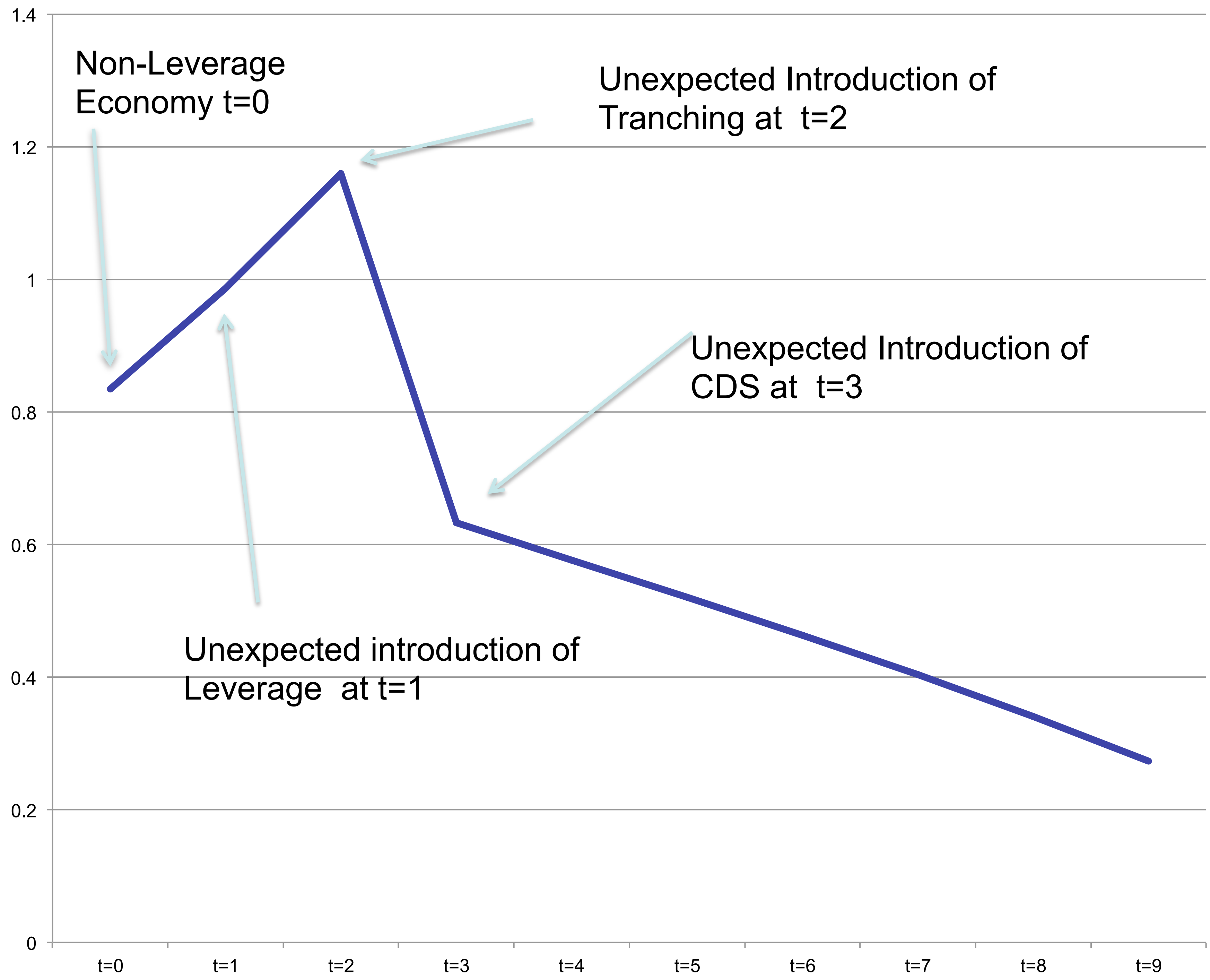
Leverage Cycle and CDS

- CDS market not standardized for mortgages until 2005.
- CDS allow pessimists to leverage their opinion that market is too high instead of sitting on sidelines.
- That was another shock at top of bubble.
- Market might never have gotten so high if CDS traded from beginning.



Source: IBS OTC Derivatives Market Statistics

Big growth, but after
Growth in securitization

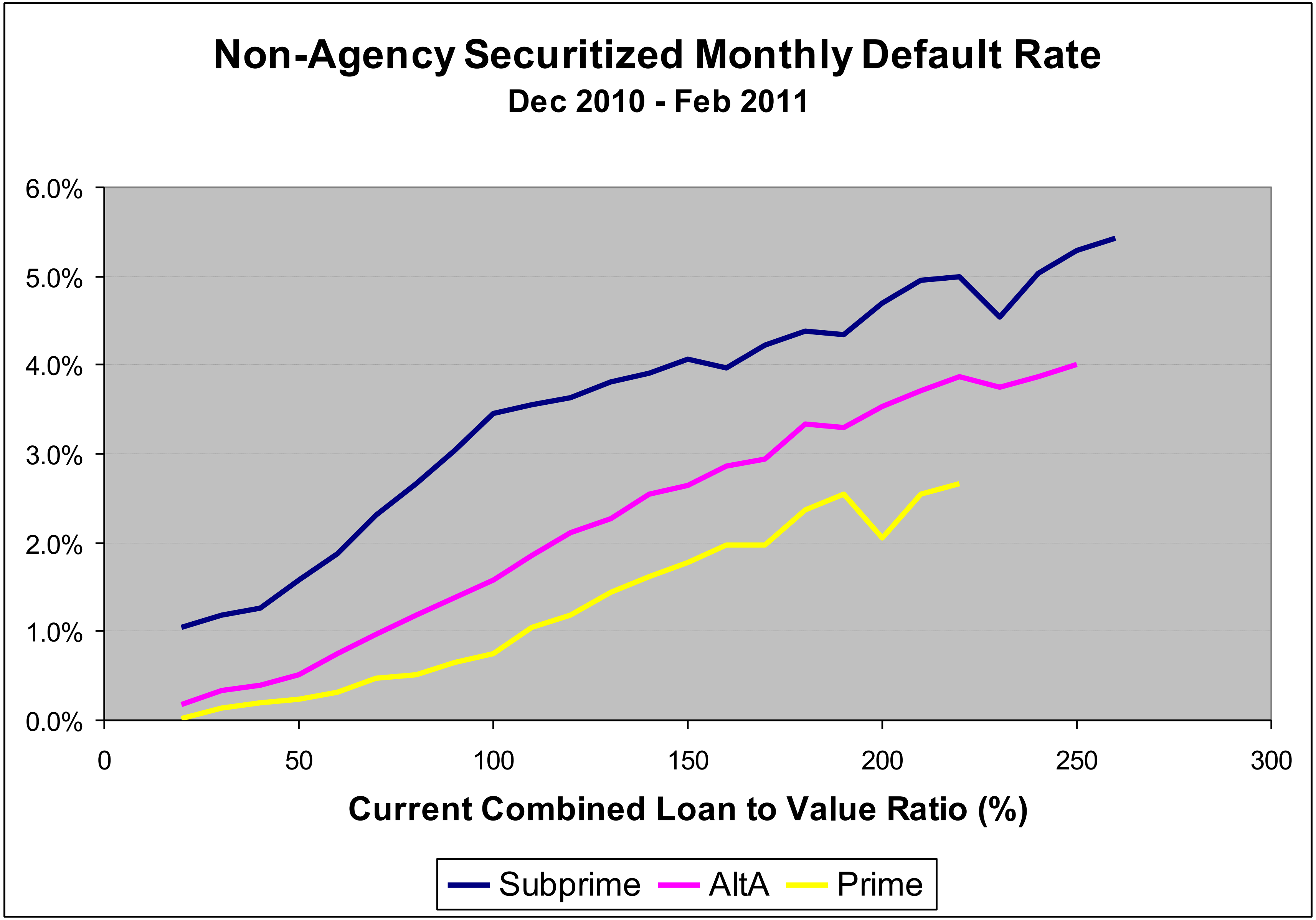

Non-Leverage Economy t=0
Unexpected Introduction of Tranching at t=2
Unexpected Introduction of CDS at t=3
Unexpected introduction of Leverage at t=1
1.4
1.2
1
0.8
0.6
0.4
0.2
0
t=0
t=1
t=2
t=3
t=4
t=5
t=6
t=7
t=8
t=9

Write Down Principal

- Crisis stage of leverage cycle always involves lots of firms and people underwater. This causes tremendous uncertainty, exacerbating crisis.
- Usually necessary to resolve these problems quickly by taking losses right away and writing down principal.
- Failure to do so loses for everyone.
- Underwater won’t fix house, can’t borrow to do it even if wanted to.

Foreclosures

- Homeowners defaulting primarily because they are underwater. Reducing their interest rates temporarily will not solve any problems, but make them worse.

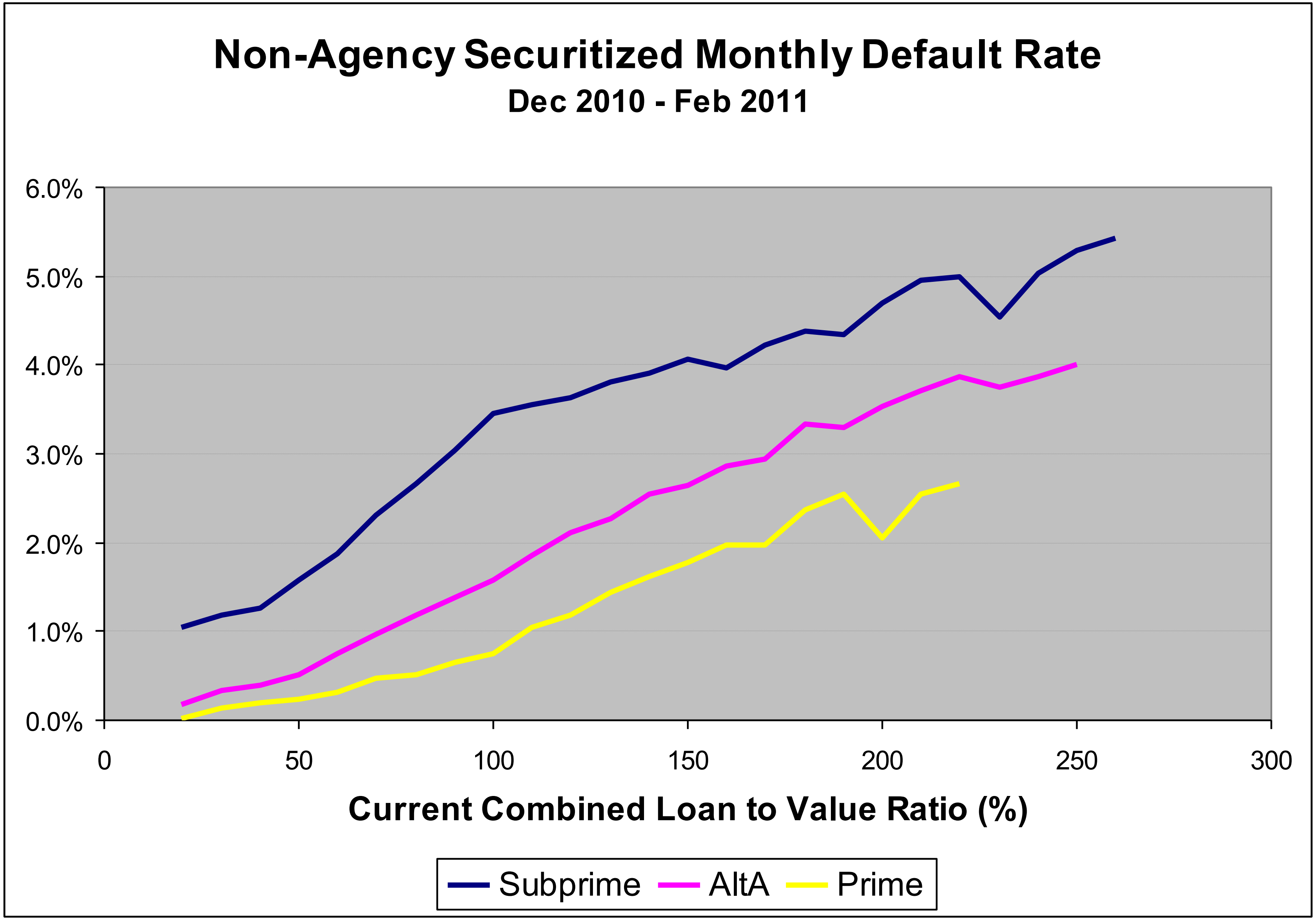

Non-Agency Securitized Monthly Default Rate
Dec 2010 - Feb 2011
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
0
50
100
150
200
250
300
Current Combined Loan to Value Ratio (%)
Subprime
AltA
Prime

Why servicers won't write down principal

- Expensive to hire staff to figure out how far to write it down
- Fee would be cut by same proportion
- Homeowner might then sell house and then servicer loses whole fee.
- Servicers owned by big banks which own huge number of second loans – if cut first loan principal, second loan should be cut to zero.

Why big banks cut principal but not enough

- They don't have to mark loans to market
- They don't want to take write downs now, even if it will cost more money down the road.



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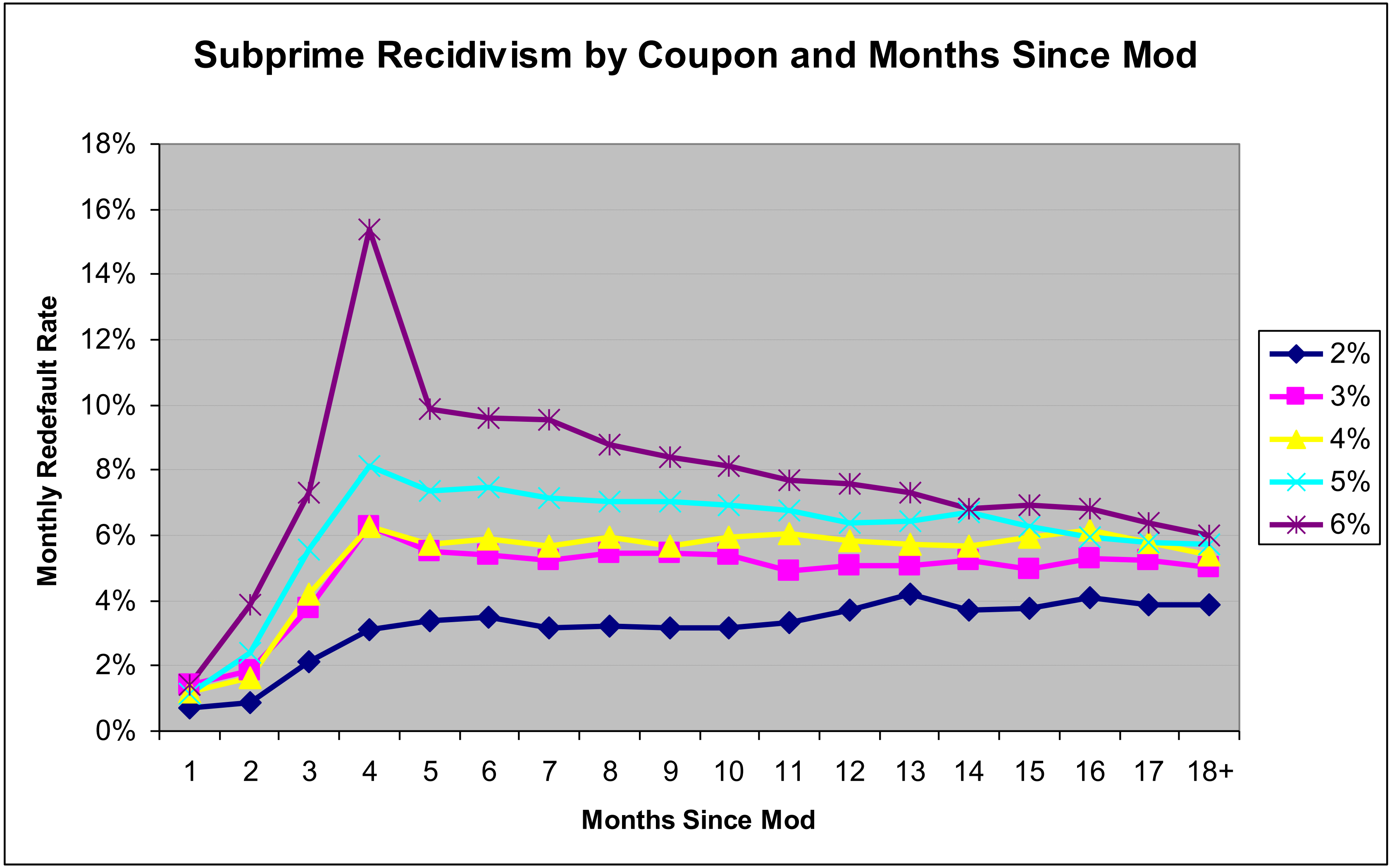
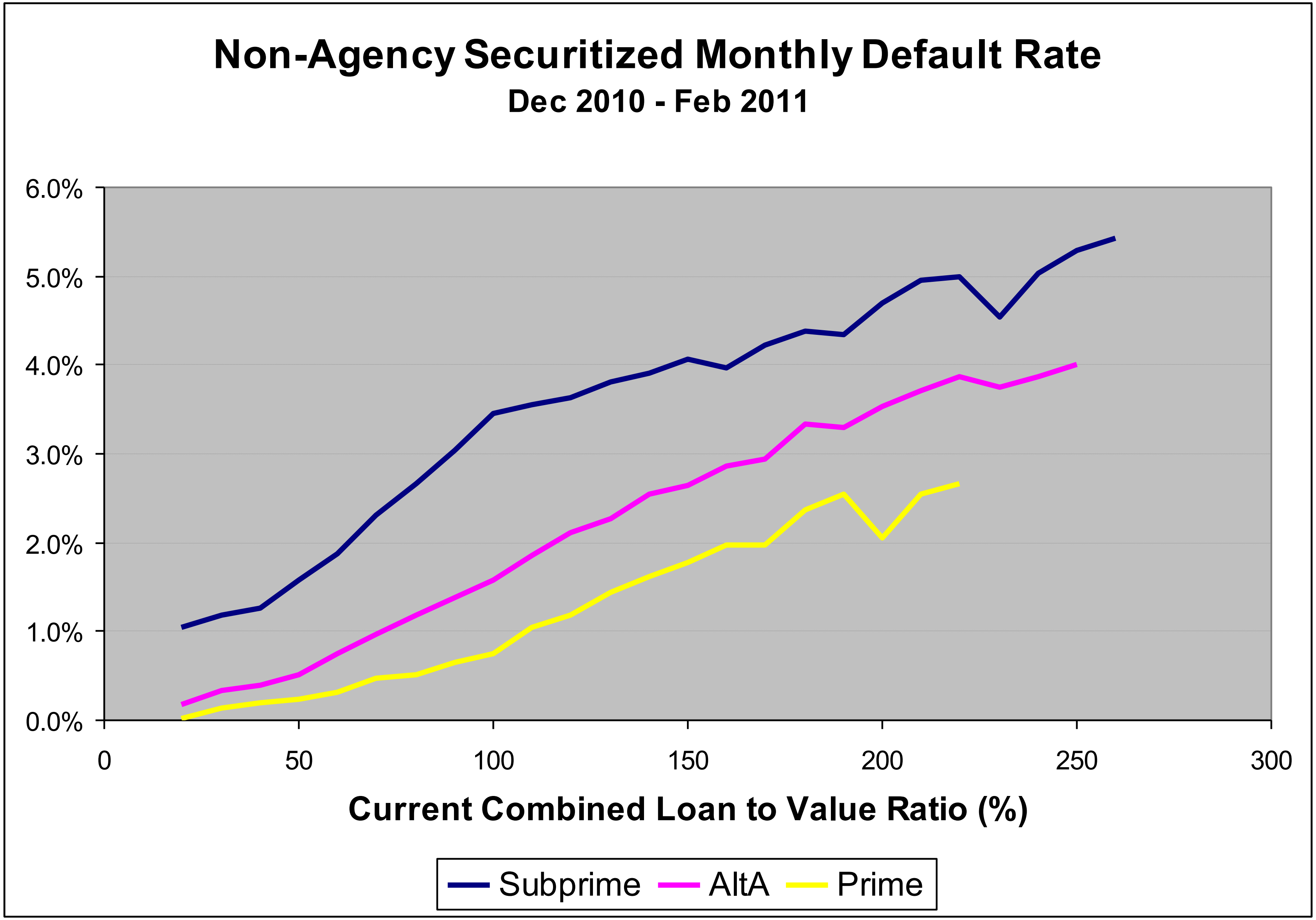

Subprime Recidivism by Coupon and Months Since Mod
Monthly Redefault Rate
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18+
Months Since Mod
2%
3%
4%
5%
6%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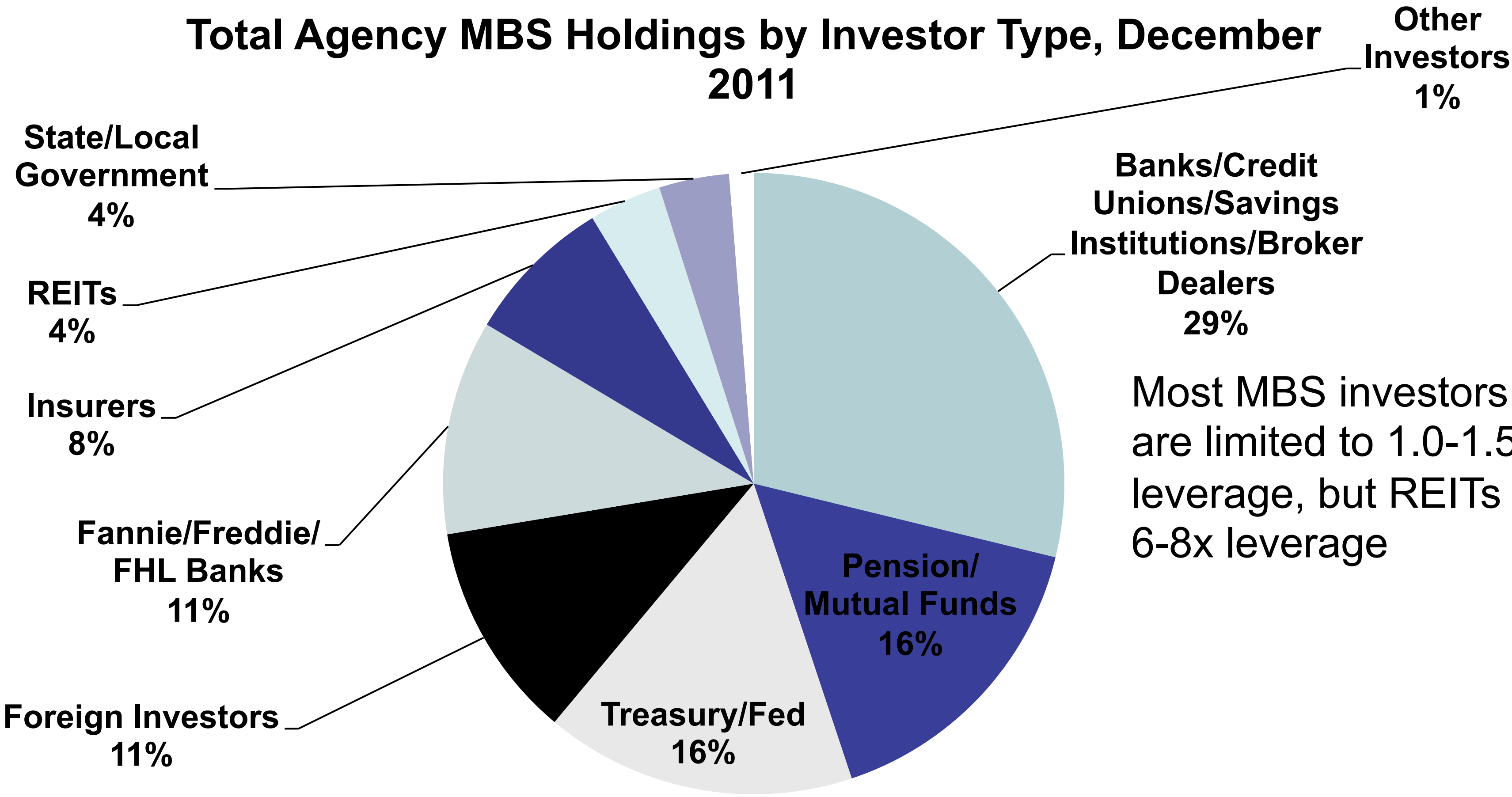
This crisis has been a typical leverage cycle

- Too much leverage caused boom, as it has many others
- Leverage should be regulated; so far nothing much done about it.
- Too little leverage helped cause crash. No permanent facility put in place to increase leverage in a crisis.
- In early stage of crisis, banks must be forced to raise equity; instead got forbearance.
- Only way to end the aftermath is to force lenders to forgive debt. This also hasn't happened.



Most MBS investors are limited to 1.0-1.5x leverage, but REITs get 6-8x leverage

MBS Holdings by Investor, Mortgage Type, and As Of Date

As Of Date	Dec-09	Dec-10	Dec-11	Dec-11	Dec-11	Most Recent (06-10/2012)
Mortgage Type	All MBS	All MBS	All MBS	Non-Agency	Agency	Agency
Banks/Credit Unions/Savings Institutions/Broker Dealers	$1,502.4	$1,585.0	$1,740.4	$199.2	$1,541.3	
Pension/Mutual Funds	$1,268.0	$1,025.0	$1,076.0	$216.0	$860.0	
Treasury/Fed	$1,098.9	$1,147.8	$865.8	$0.0	$865.8	$868.0
Foreign Investors	$930.0	$895.0	$825.0	$220.0	$605.0	$542.0
Fannie/Freddie/FHL Banks	$1,257.7	$886.0	$742.2	$144.9	$597.3	$427.0
Insurers	$513.0	$576.0	$585.0	$170.0	$415.0	
REITs	$65.0	$167.0	$211.0	$9.0	$202.0	$321.0
State/Local Government	$180.0	$161.0	$207.0	$12.0	$195.0	
Other Investors	$155.5	$167.0	$184.7	$116.8	$67.8	
Total	$6,970.5	$6,609.8	$6,437.1	$1,087.9	$5,349.2	

Dangers Now

- Doesn't help people who can't borrow
- If Fed loses money to get people to do something where does that show up?
- Crash, no lending again
- People might save more when interest rates go down
- Wealth effect
- Push investors into higher yield instruments

What happened to spending

- Residential construction
- Durables
- Firm investments
- Local Government intervention

Leverage dramatically increased from 1999-2006

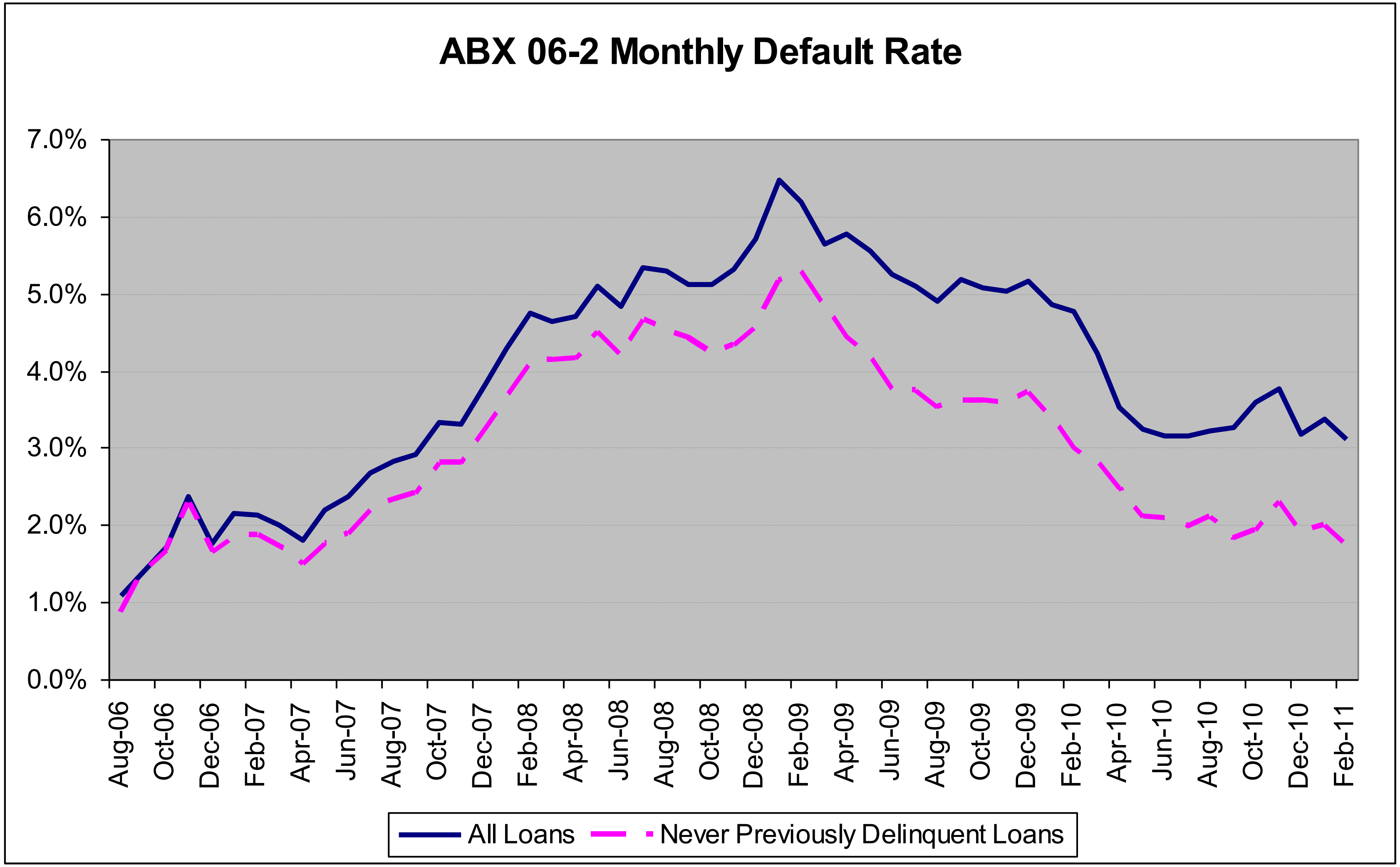
- A bank that wanted to buy a AAA mortgage security could borrow 98.4% of purchase price, paying down only 1.6% cash. That's over 60 to 1 leverage.
- Average leverage in 2006 across all $2.5 trillion of toxic mortgage securities was 16 to 1.
- So buyers only had to pay $150 billion cash, and borrow $2.35 trillion! Warren Buffet and Bill Gates alone could have bought all toxic mortgage securities in 2006.

- Home buyers could get mortgage with 3% down in 2006, for leverage 33 to 1.

Then leverage drastically curtailed by nervous lenders wanting more collateral

- Toxic mortgage securities leverage fell to average less than 1.2 to 1.

- Homes leveraged only 3 to 1 unless get government guaranteed loan


ABX 06-2 Monthly Default Rate
7.0%
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
Aug-06
Oct-06
Dec-06
Feb-07
Apr-07
Jun-07
Aug-07
Oct-07
Dec-07
Feb-08
Apr-08
Jun-08
Aug-08
Oct-08
Dec-08
Feb-09
Apr-09
Jun-09
Aug-09
Oct-09
Dec-09
Feb-10
Apr-10
Jun-10
Aug-10
Oct-10
Dec-10
Feb-11
All Loans
Never Previously Delinquent Loans

Percentages of Each Type of Modification by Investor in Third Quarter 2010

	Fannie Mae	Freddie Mac	Government-Guaranteed	Private Investor	Portfolio	Overall
Capitalization	98.3%	98.2%	99.6%	78.8%	58.8%	87.5%
Rate Reduction	91.1%	78.7%	97.1%	87.5%	70.8%	86.2%
Rate Freeze	2.2%	2.9%	0.4%	2.0%	2.0%	1.9%
Term Extension	51.0%	67.4%	81.0%	38.8%	59.6%	57.4%
Principal Reduction	0.0%	0.0%	0.0%	0.2%	25.1%	4.5%
Principal Deferral	11.7%	12.6%	0.1%	11.5%	13.8%	10.1%
Unknown	0.2%	0.3%	0.2%	1.2%	9.1%	2.0%

Re-Default Rates for Portfolio Loans and Loans Serviced for Others (60 or More Days Delinquent)*

Investor Loan Type	Three Months After Modification	Six Months After Modification	Nine Months After Modification	12 Months After Modification
Fannie Mae	15.2%	27.6%	42.5%	52.5%
Freddie Mac	16.2%	28.7%	44.2%	55.8%
Government- Guaranteed	21.6%	42.9%	55.9%	62.3%
Private	28.1%	42.1%	52.5%	58.2%
Portfolio Loans	9.2%	18.2%	24.8%	30.1%
Total	20.0%	33.8%	44.7%	51.4%

Source: OCC and OTS Mortgage Metrics Report – Fourth Quarter 2010

- **Of loans in ABX 07-2 (subprime loans made in the 1st half of 2007, shortly before the subprime market shutdown):**
  - 10% have paid off voluntarily
  - 60% have either been liquidated or are delinquent
  - 30% remain outstanding and are current
    - 10% have been delinquent at some point, but are current today due to modification
    - 20% have always been current

Will Dodd-Frank help?

- Established Financial Stability Oversight Council (FSOC), chaired by Secretary of Treasury, with Chairman of Fed, and chairs of other large regulatory bodies.
- Giving responsibility is helpful.
- Similar to Reagan’s President’s Advisers Council.
- Difference of Office of Financial Research, who must gather data and report directly to Congress each year on systemic risks.

Why hasn't Obama administration solved the present crisis?

Worried about the Banks

- Their thinking is that the crisis threatened to bring down the whole banking sector.
- God help America if that happened.
- So every policy designed to pump money into banks and to convince public they are sound.
- Keep everything afloat. Do no harm.
- Sit back and wait for a miracle.

Banks

- Lowering short rates enriches banks.
- Reducing interest on subprime loans (instead of cutting principal) enriches banks.

Why Fed and Obama team underestimated size of recession

- They predicted unemployment would top out at 8%. They still claim they saved millions of jobs.
- They figured lowering the interest rates and a small stimulus would pull the economy out of its slump.
- They have nothing in their models to calibrate credit frictions like increased collateral requirements, or people under water.

Need inflation

- Reduce government debt.
- Bring homeowners out from underwater.
- It is inevitable.

Need stimulus

- Put 20% of construction workers now unemployed into building infrastructure.
- Good infrastructure makes money for country in long run, even if done at full employment.
- Makes much more sense with unemployment.
- People say debt got us into trouble, can't have more.
- Argument backward. Project could lower net liability of country. People still willing to lend to US.

Remark on Default in General Equilibrium

- Hadn't ever been put in GE. Modeled by game theorists and principal agent theorists. Very complicated.
- Key to making it simple and tractable in GE is to model it as perfect competition by taking prices and default rates as given, equilibrating variables.
- But that presumes that every lender gives any borrower a tiny amount of money,

Remark on Money

- Want finite horizon model to be tractable.
- Why would money have value in last period?
- In standard macro infinite horizon model, things are so complicated that need to assume one or two agents and do linearization just to solve.
- Idea of outside money m owned free and clear by agents. Inside money M lent by central bank. Central bank wants money back at end. Interest rates will rise so all m+M owed back at end. So money does have value and model tractable.

Remark on Agent Based vs GE

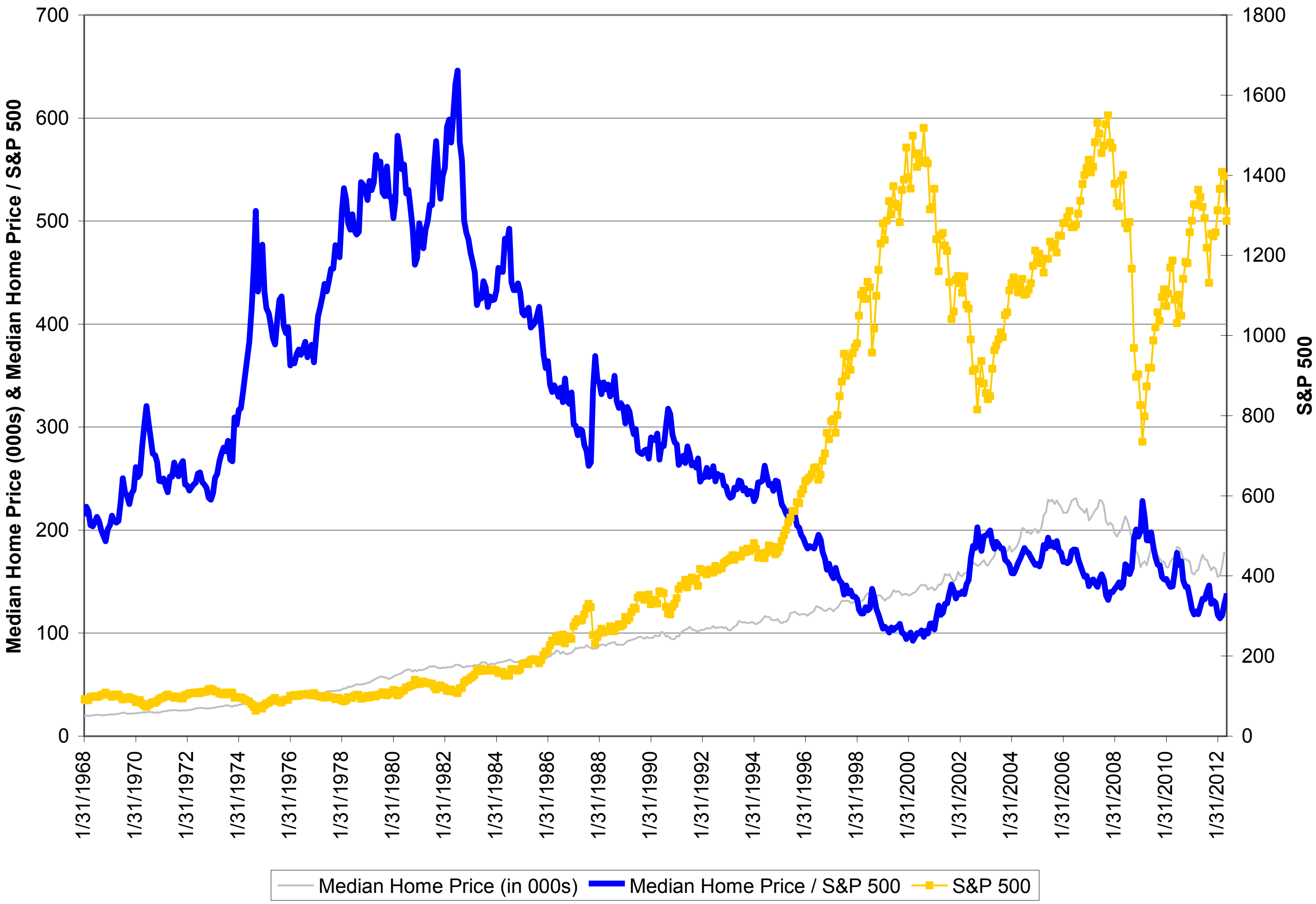
- Simpler, but expectations may be wrong.
- With Thurner and Farmer, did simulation of asset market and leverage.
- Noise traders think asset is worth what it was last period plus random noise. Noise slightly biased so valuation biased toward V.
- Hedge funds buy more as price gets further below V.

Fat Tails and Clustered Volatility

- Simulate, get prices nearly random walk.
- If let hedge funds leverage, then volatility goes way down as allowed leverage goes up because funds hold price near V.
- But occasionally bad luck from noise traders forces prices down and then margin calls force funds to sell and get crash.
- Get fat tails and clustered volatility.
- Volatility lowest just before crash.

Historically Cheap Asset Class

Homes near historical low valuation relative to equities



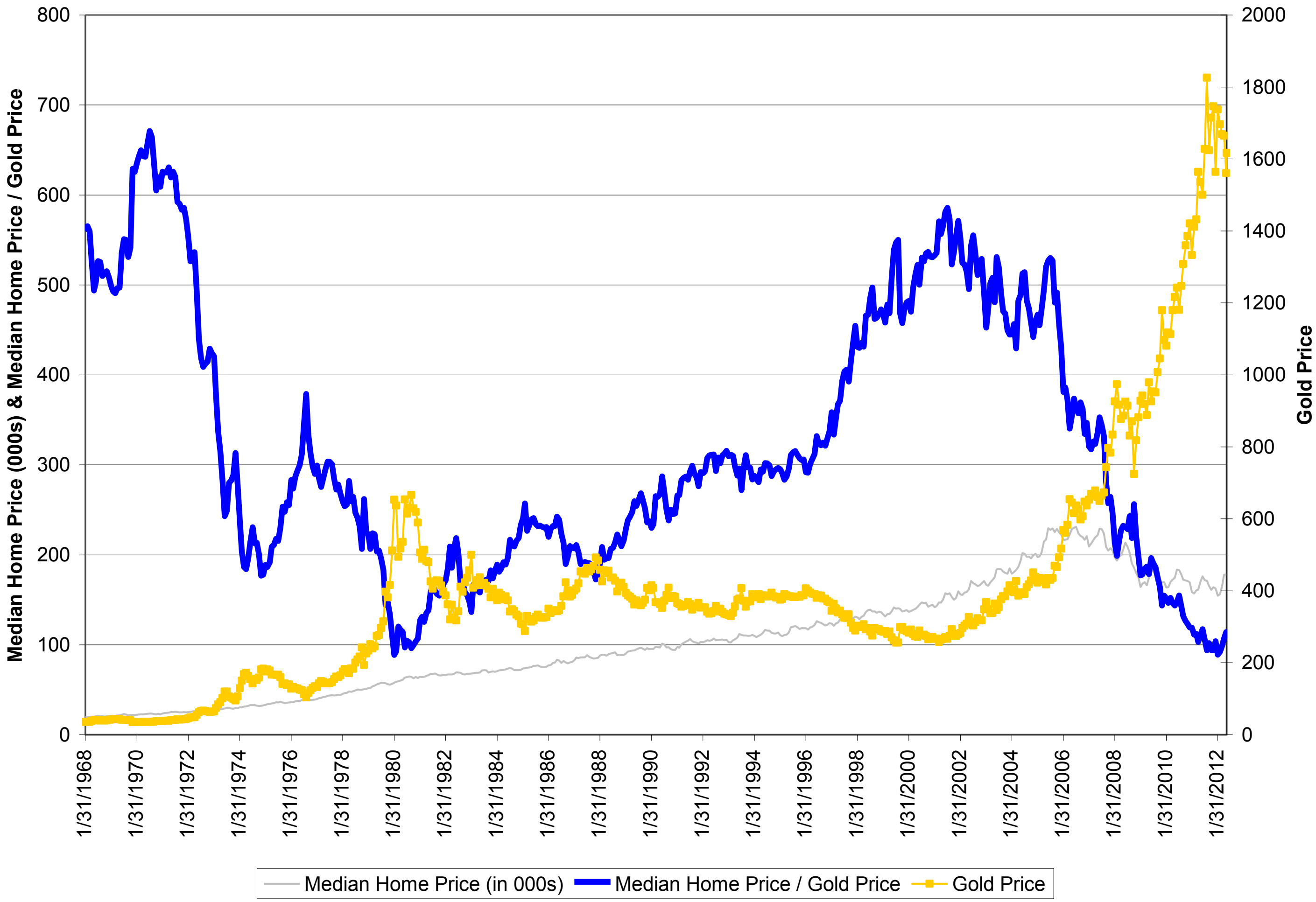
Sources: Bloomberg, National Association of Realtors

115 units of S&P 500 to buy the median home vs. historical peak over 600

109

Historically Cheap Asset Class

The last time homes were this cheap compared to gold was during the Paul Volcker era in 1980…



Sources: Bloomberg, National Association of Realtors

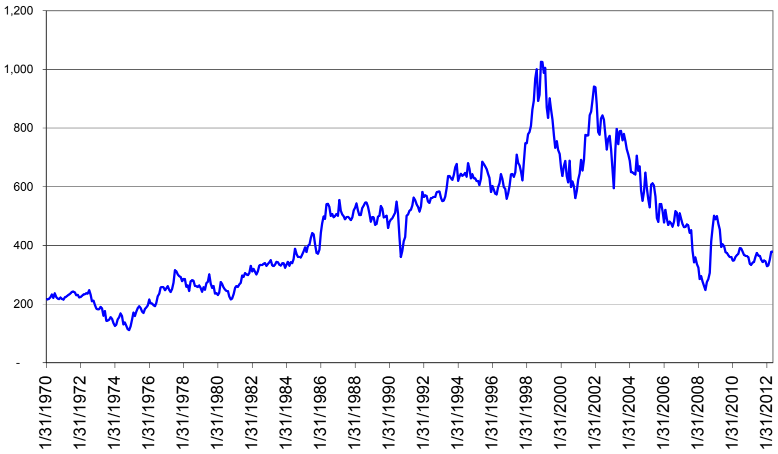
… Homes outperformed gold by 500%+ over the next 20 years (*without* including rental yield)

110

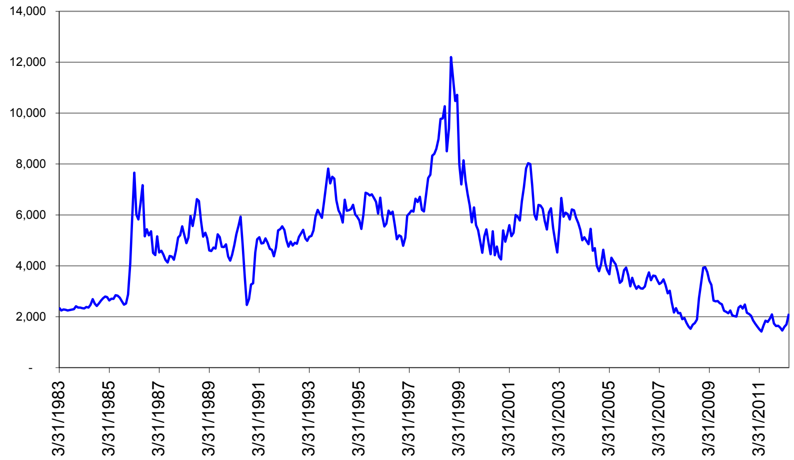
Historically Cheap Asset Class

Homes at low valuations compared to commodities, bonds, and REITs

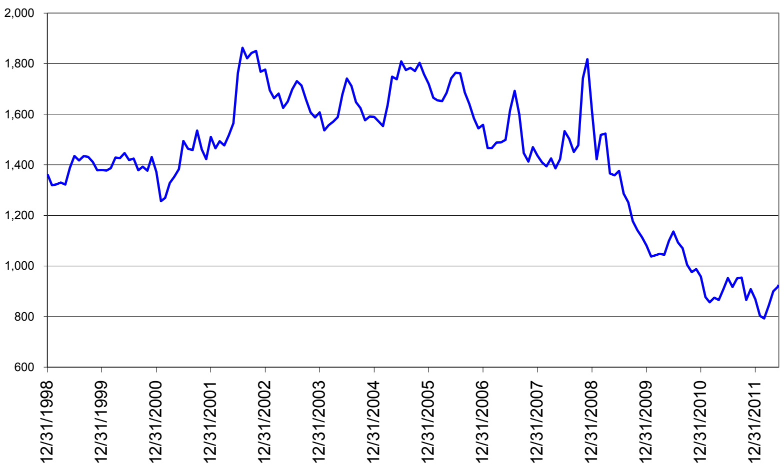
Median Home Price / S&P GSCI Index



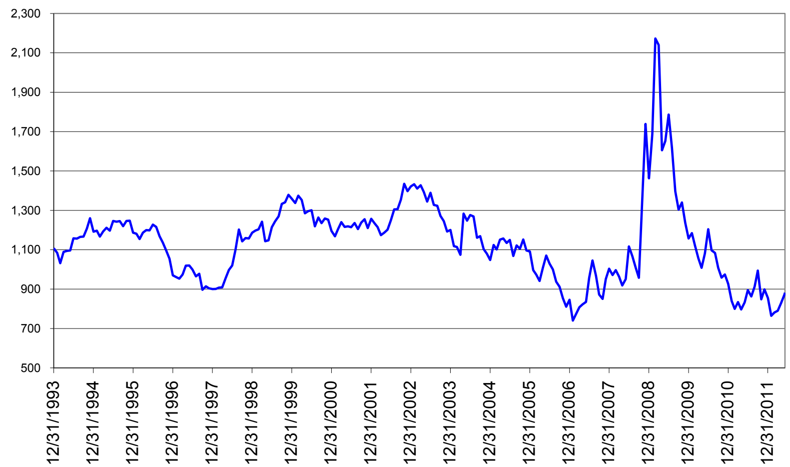
Median Home Price / Oil Price



Median Home Price / iBoxx HY Index



Median Home Price / Bloomberg REIT Index



Sources: Bloomberg, National Association of Realtors

111

Historically Cheap Asset Class

Where else can you get a reasonable current yield, inflation protection, equity-like upside, all at a distressed price?

Asset Class	Approximate Current Yield	Inflation Protection	Equity-Like Price Upside?	Currently at Distressed Price?
Gold	0%	Yes	Maybe	No
TIPS	~0%	Yes	No	No
Treasuries	~2%	No	No	No
Property REIT's	3% - 4%	Yes	Yes	No
High Yield Bonds	6% - 8%	No	No	No
Equities	~2%	Yes	Yes	No
Non-Agency RMBS	8% - 11%	Maybe	Maybe	Maybe
Single Family Rental Homes	6% - 8%	Yes	Yes	Yes

Houses are the only asset class that has not appreciated dramatically since March 2009

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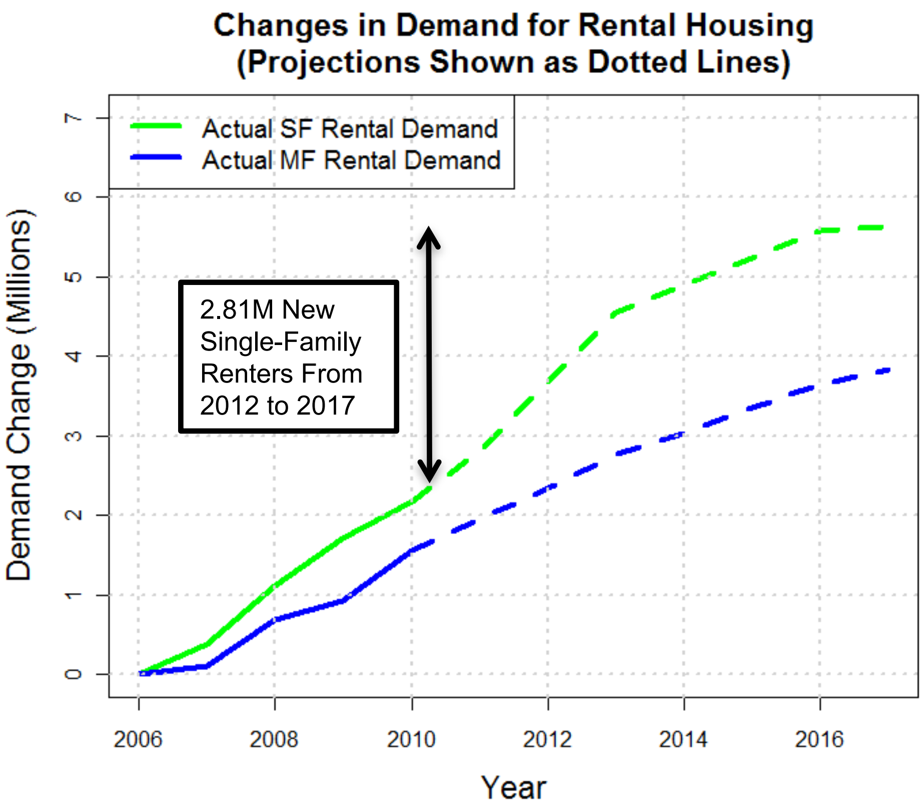
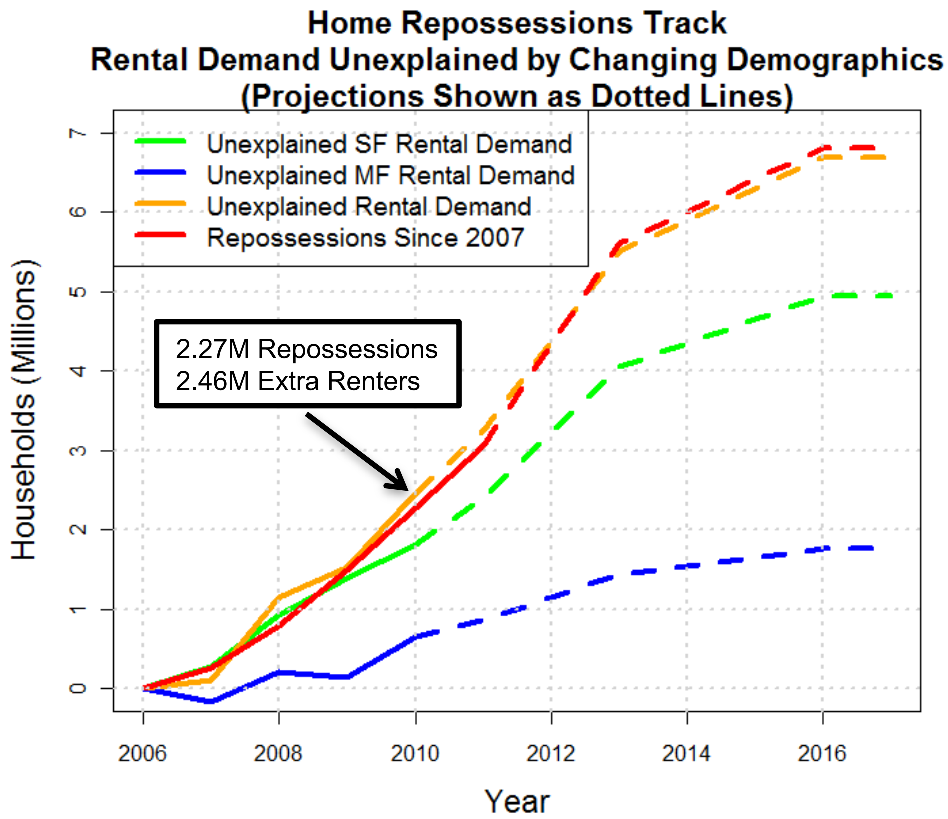
Foreclosures Driving Rental Demand

- Foreclosures are turning America into a rentership society
  - Foreclosures track extra renter households almost 1-for-1 since 2006 (2.27M vs 2.46M)
  - Ellington mortgage databases facilitate more accurate foreclosure projections
  - We project 17.9M SF Renters by 2017, up from 14.4M in 2010 and 12.1M in 2005

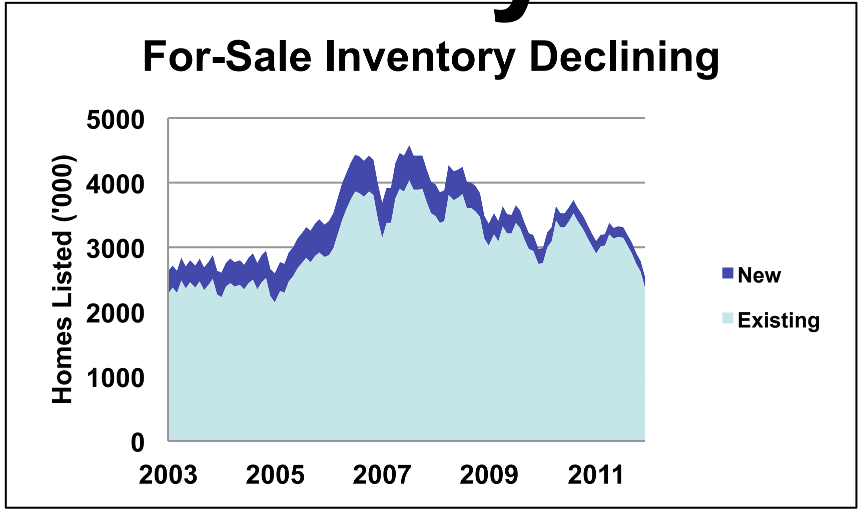


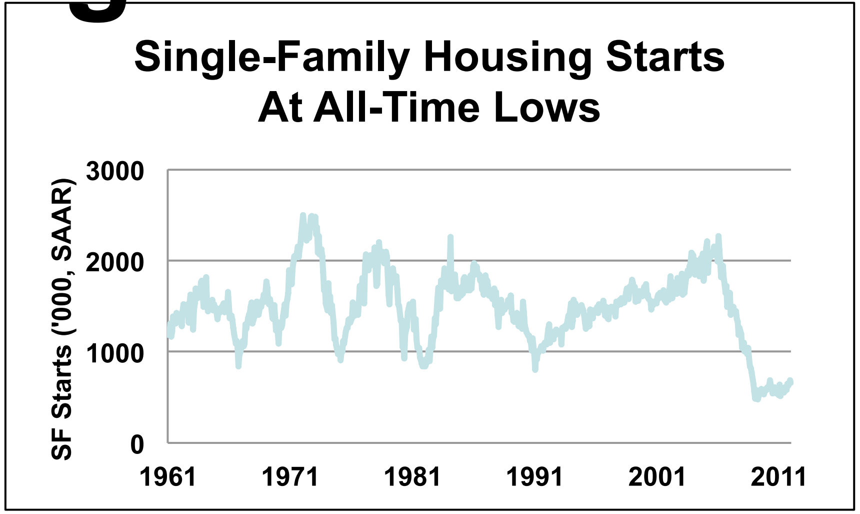


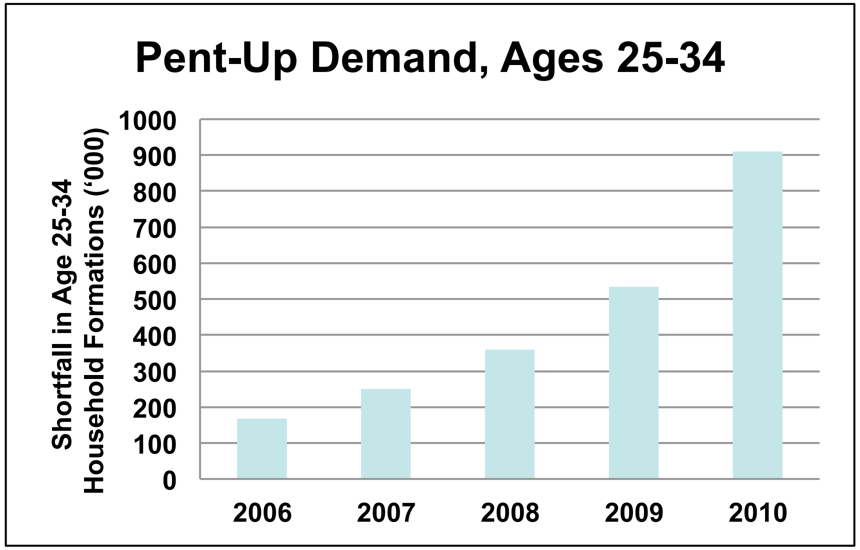
Sources: US Census Bureau, LPS Applied Analytics, Ellington Estimates

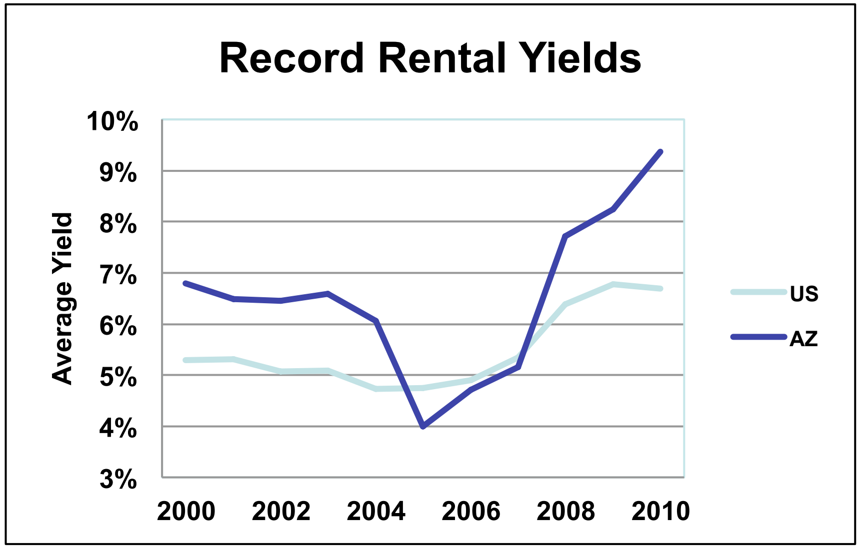
Increasing demand for limited supply of homes is good for rental business

Market Opportunity: Tight Inventory and High Yields









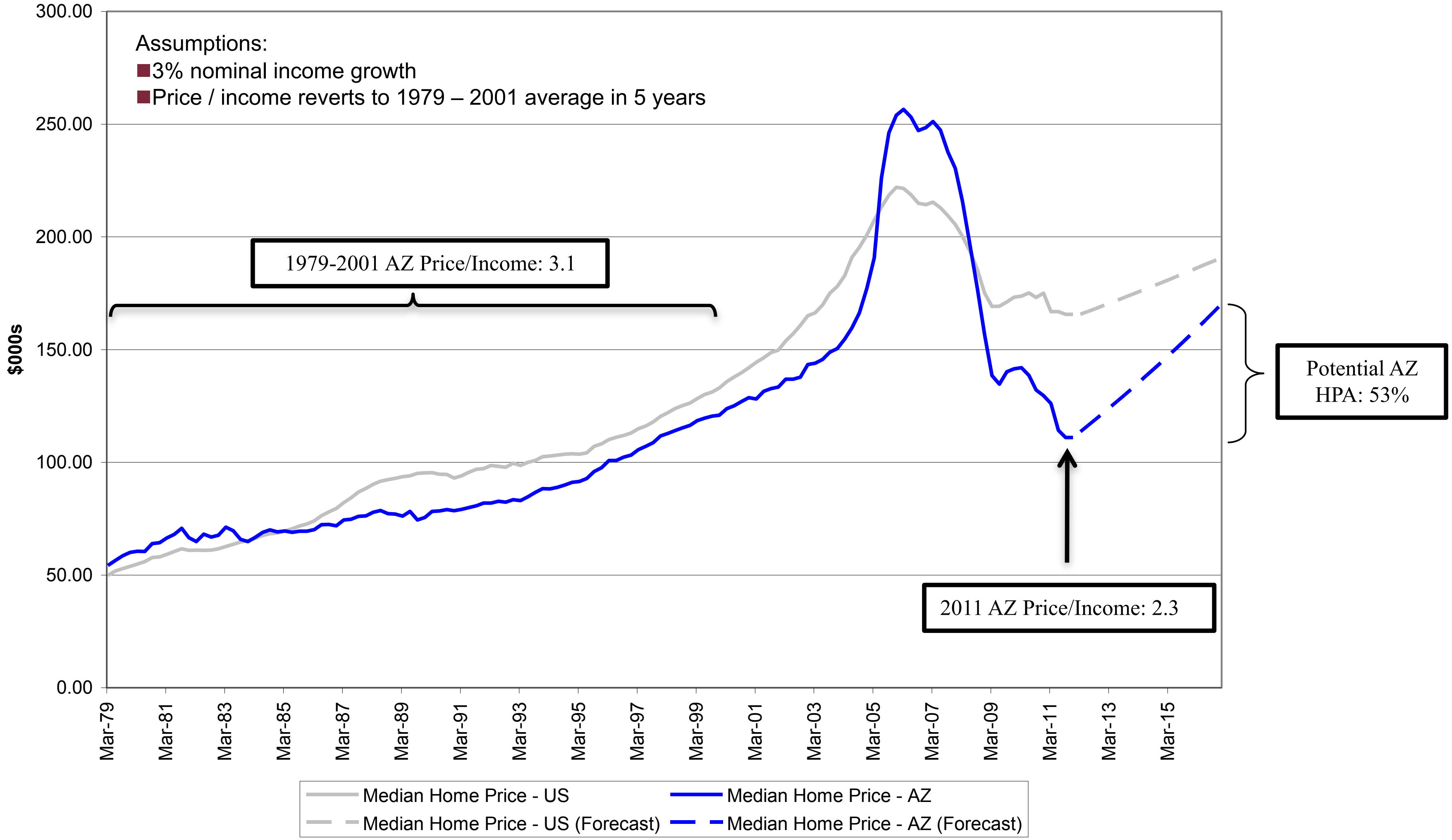
"Shortfall" = Additional number of households we would expect if headship rates by age, race, and employment status remained at 2005 levels

Sources: US Census Bureau, Ellington Estimates

Conditions are ripe to deploy capital now

Market Opportunity: Record Home Affordability

Historically low price/income provides high rental yields and potential future HPA



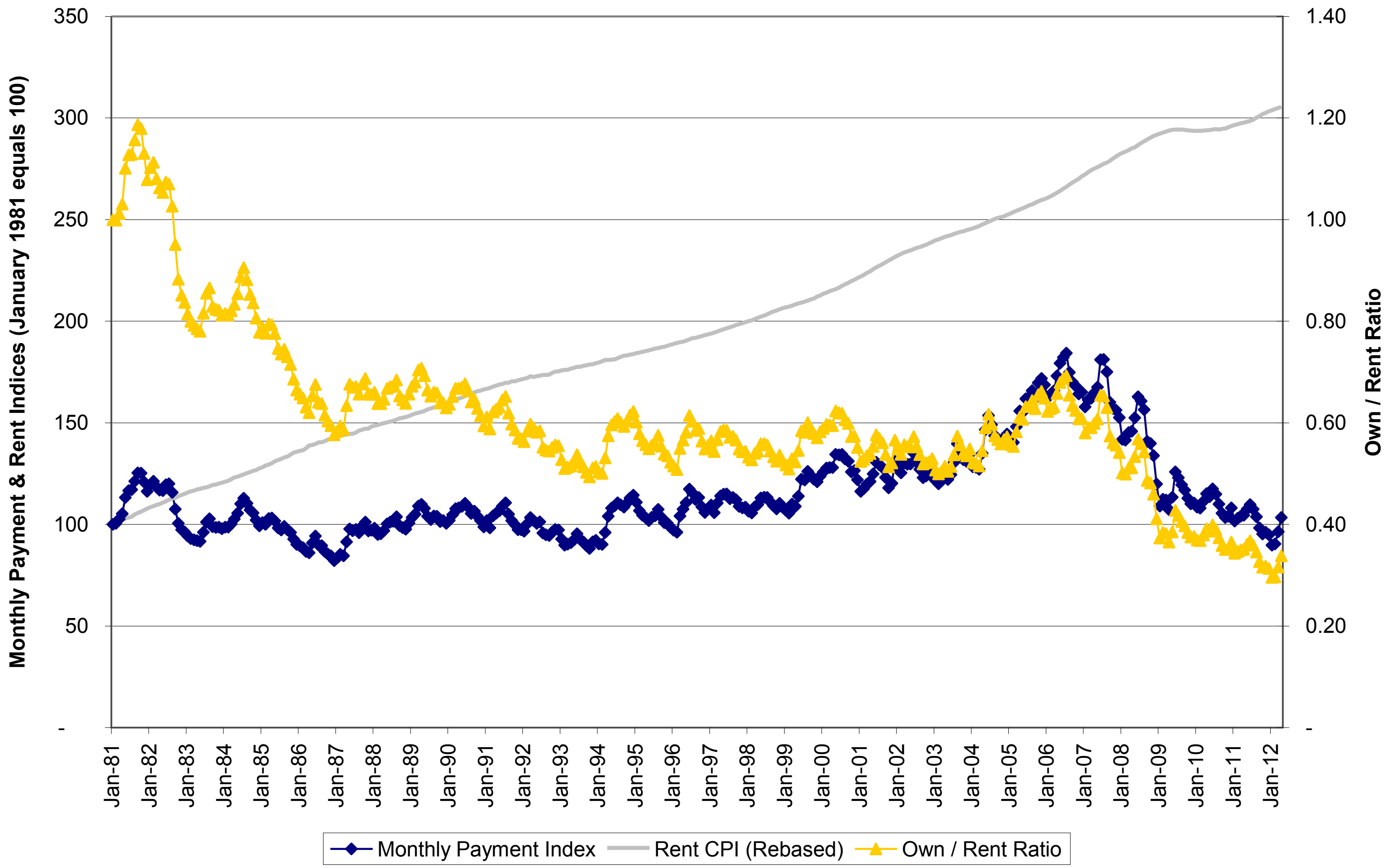
Sources: US Census Bureau, National Association of Realtors, Ellington Estimates

Reversion to mean in select MSAs implies 9% annualized HPA

Record Home Affordability

Monthly mortgage payment on the median home is lower than in 1981…

Rent vs. Own Comparison 1981 - 2011

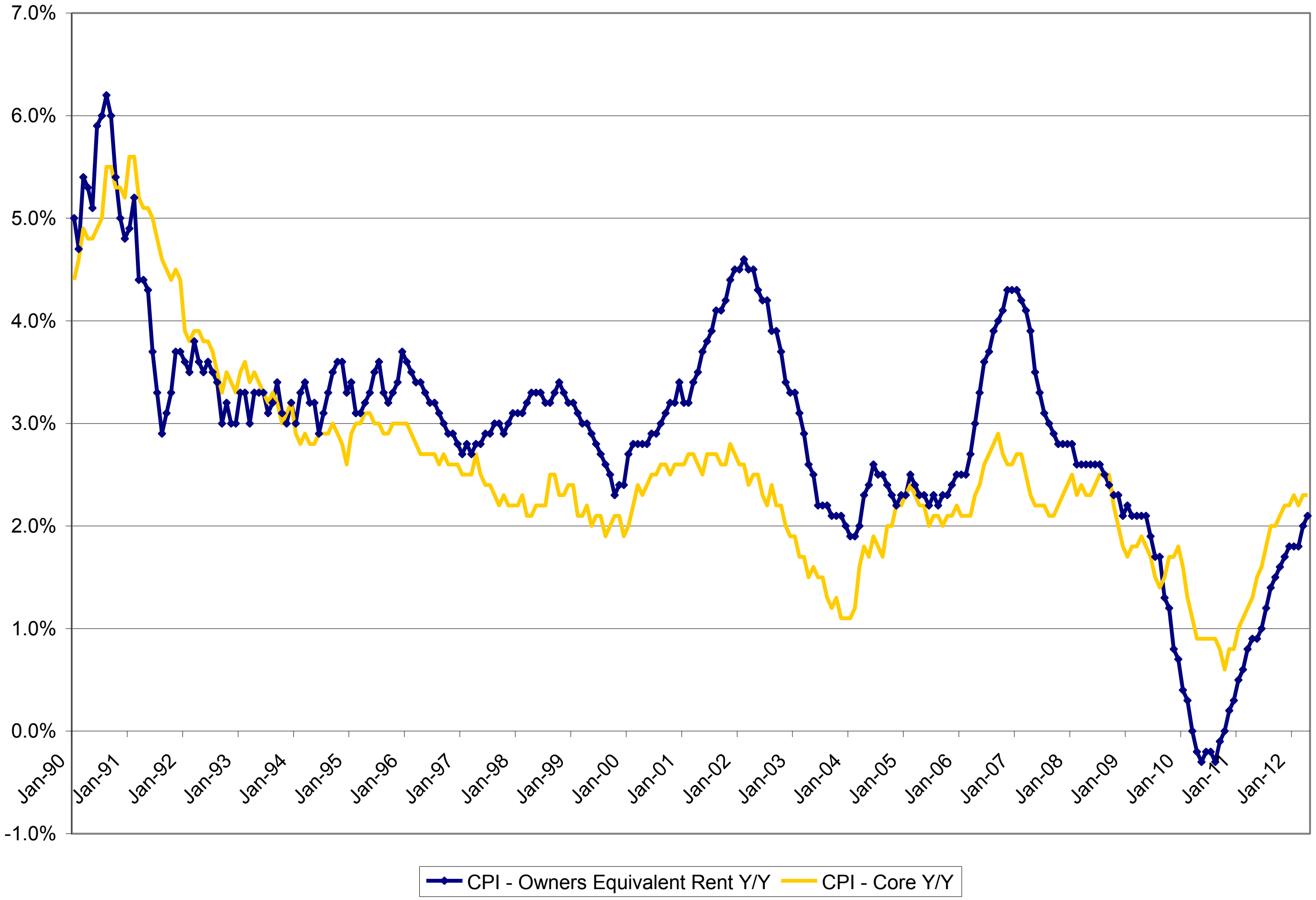


Note: 30 year mortgage with no down payment at the Freddie Mac published average rate
Sources: National Association of Realtors, Bureau of Labor Statistics, Freddie Mac, Ellington Estimates

… while rents have more than tripled

Market Opportunity: Rent Inflation

Historically rents have grown faster than core CPI…



Source: Bureau of Labor Statistics

… and have started increasing again in late 2010 with the economic recovery